IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA

MIYOKO'S KITCHEN,

Plaintiff,

v.

KAREN ROSS, in her official capacity as Secretary of the California Department of Food and Agriculture, and STEPHEN BEAM, in his official capacity as Branch Chief of the Milk and Dairy Food Safety Branch,

Defendants.

Case No. 3:20-cv-893-RS

DECLARATION OF NEIL SAWHNEY IN SUPPORT OF MOTION FOR PRELIMINARY INJUNCTION

I, Neil K. Sawhney, declare as follows:

1. I am one of the attorneys for the plaintiff in this case, Miyoko's Kitchen, and am making this declaration in support of Miyoko's motion for a preliminary injunction.

2. Attached as Exhibit A is a true and authentic copy of a letter from Beth Panko Briczinski, a vice president of the National Milk Producers Federation (NMPF), to the Food and Drug Administration, dated January 3, 2018. I obtained this letter from the NMPF's website, and it is accessible at: https://www.nmpf.org/files/files/NMPF Kite Hill Letter to FDA 2018 01 03.pdf.

3. Attached as Exhibit B is a true and authentic copy of a letter from Robert D. Byrne, a vice president of the NMPF, to the Food and Drug Administration, dated November 2, 2001. This letter was included as "Attachment 10" to the NMPF's August 29, 2017 public comment to a pending FDA petition (Docket ID: FDA-2017-P-1298). The letter is accessible at: https://www.regulations.gov/document?D=FDA-2017-P-1298-0092.

4. Attached as Exhibit C is a true and authentic copy of a letter from Robert D. Byrne, a vice president of the NMPF, to the Food and Drug Administration, dated February 14, 2000. This letter was included as "Attachment 11" to the NMPF's August 29, 2017 public comment to a pending FDA petition (Docket ID: FDA-2017-P-1298). The letter is accessible at: https://www.regulations.gov/document?D=FDA-2017-P-1298-0092.

5. Attached as Exhibit D is a true and authentic copy of a petition filed by the United States Cattlemen's Association before the U.S. Department of Agriculture's Food Safety and Inspection Service, dated February 9, 2018. This document is accessible on the Department of Agriculture's website at:

https://www.fsis.usda.gov/wps/wcm/connect/e4749f95-e79a-4ba5-883b-394c8bdc97a3/18-01-Petition-US-Cattlement-Association020918.pdf?MOD=AJPERES.

6. Attached as Exhibit E is a true and authentic copy of a letter from Beth Panko Briczinski, a vice president of the National Milk Producers Federation (NMPF), to the California Milk and Dairy Food Safety Branch, dated January 3, 2018. I obtained this letter from the NMPF's website, and it is accessible at:

https://www.nmpf.org/files/files/NMPF%20Kite%20Hill%20Letter%20to%20CDFA%202018%2001%2003_0.pdf.

7. Attached as Exhibit F is a true and authentic copy of *Consumer Accuracy at Identifying Plant-based and Dairy-based Milk Items*, a research study authored by Silke Feltz and Adam Feltz at the University of Oklahoma. This study was attached to a public comment that the UCLA School of Law Animal Law and Policy Program submitted to the Food and Drug Administration (Docket Number FDA-2018-N-2381-0317) and is accessible at:

https://www.regulations.gov/document?D=FDA-2018-N-2381-1104.

8. I declare under penalty of perjury, pursuant to 28 U.S.C. § 1746, that the foregoing is true and correct.

Executed this 26 day of May, 2020

/s/ Neil K. Sawhney
Neil K. Sawhney

EXHIBIT A

National Milk Producers Federation

2107 Wilson Blvd., Suite 600, Arlington, VA 22201 | (703) 243-6111 | www.nmpf.org

January 3, 2018

Ms. Felicia Billingslea
Director Food Labeling and Standards
US Food and Drug Administration
CPK 1 HFS-820
5001 Campus Drive
College Park, MD 20740

Re: Kite Hill "Artisan Almond Milk Yogurt"

Dear Ms. Billingslea,

We write to call your attention to a line of so-called "Artisan Almond Milk Yogurt" products manufactured by Kite Hill and distributed in interstate commerce by California-based Lyrical Foods, Inc., that are not only misbranded, but also falsely imply they are a suitable substitute for real dairy yogurt. When a food product's label attempts to skirt federal and state law, it is the obligation of regulators to rectify the situation.

Kite Hill's imitation "yogurt" product does not comply with the federal standard of identity for "yogurt" (21 CFR 131.200). The standard defines "yogurt" as produced by culturing cream, milk, partially skimmed milk, or skim milk, alone or in combination, with specific lactic acid bacteria. The standard does not include plant-based beverages among the required or optional ingredients that may be used in yogurt manufacture. Because this non-dairy product is labeled with the name of a standardized dairy food without conforming to the associated standard of identity, these products are misbranded.

Furthermore, Kite Hill's ploy to market its product using dairy food terminology can lead consumers to think its imitation "yogurt" is a nutritionally viable substitute for cow's milk yogurt. However, without real milk's many nutrients as a base, this fake yogurt product fails to deliver the same nutrition as the real thing. In fact, the Kite Hill product contains 40 percent more calories and 10 more grams of fat compared to an equivalent serving of vanilla yogurt, while at the same time offering one-third less protein and zero calcium.

According to federal labeling regulations, the name of the food must appear on the front label or principal display panel of a packaged food. In the absence of a name of the food established by law or regulation, the common or usual name of the food or an appropriate descriptive name, that is not misleading, should be used (21 CFR

101.3). Adding a word or two in front of the name of a standardized dairy food does not represent an appropriate common or usual name of the food. It only adds confusion for consumers about the nutritional content of foods.

The plant-based gels produced and marketed by Kite Hill are imitations of real dairy yogurt, and should be labeled with a fanciful name that does not include the name of a standardized dairy product on the front of the package, or labeled as an imitation product (i.e. "Almond Imitation Yogurt") in accordance with 21 CFR 101.3(e).

NMPF has also noted other violations of federal labeling regulations on this product's packaging and on the manufacturer's website (www.kite-hill.com) and want to bring this to the attention of the Food and Drug Administration. NMPF urges FDA to take immediate and decisive action against this inappropriately named "Artisan Almond Milk Yogurt" with respect to applicable food labelling regulations, specifically as they relate to the purloined use of an established statement of identity.

Please feel free to contact us with any questions or for additional information. NMPF looks forward to your response.

Respectfully,

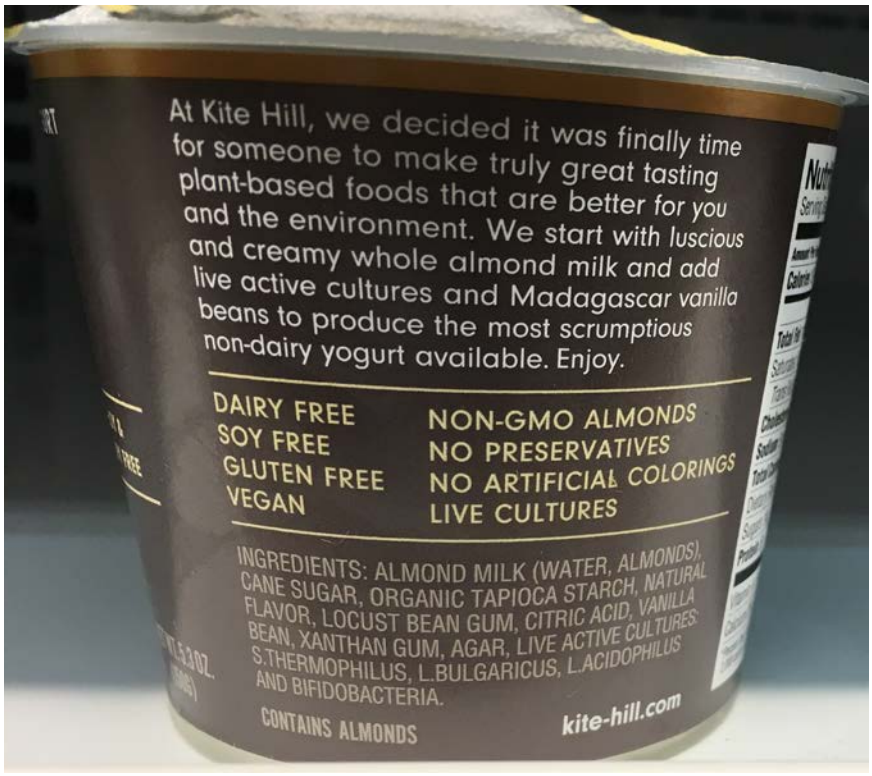
Beth Panko Briczinski, Ph.D.
Vice President, Dairy Foods & Nutrition

Enclosures

CC: Ted Elkin, Deputy Director for Regulatory Affairs, FDA-CFSAN
William Jones, Acting Director, Office of Food Safety, FDA-CFSAN
John F. Sheehan, JD, Director, Division of Dairy, Egg & Meat Products, FDA-CFSAN
Dr. Douglas A. Balentine, Director, Office of Nutrition & Food Labeling, FDA-CFSAN
Dr. Stephen W. Beam, Chief, Milk and Dairy Food Safety, CDFA

The National Milk Producers Federation, established in 1916 and based in Arlington, VA, develops and carries out policies that advance the well-being of dairy producers and the cooperatives they own. The members of NMPF's cooperatives produce the majority of the U.S. milk supply, making NMPF the voice of dairy producers on Capitol Hill and with government agencies. NMPF provides a forum through which dairy farmers and their cooperatives formulate policy on national issues that affect milk production and marketing.

Attachment: Photos of Kite Hill “Artisan Almond Milk Yogurt” Vanilla (product photographed on August 1, 2017).


At Kite Hill, we decided it was finally time for someone to make truly great tasting plant-based foods that are better for you and the environment. We start with luscious and creamy whole almond milk and add live active cultures and Madagascar vanilla beans to produce the most scrumptious non-dairy yogurt available. Enjoy.
DAIRY FREE
SOY FREE
GLUTEN FREE
VEGAN
NON-GMO ALMONDS
NO PRESERVATIVES
NO ARTIFICIAL COLORINGS
LIVE CULTURES
INGREDIENTS: ALMOND MILK (WATER, ALMONDS), CANE SUGAR, ORGANIC TAPIOCA STARCH, NATURAL FLAVOR, LOCUST BEAN GUM, CITRIC ACID, VANILLA BEAN, XANTHAN GUM, AGAR, LIVE ACTIVE CULTURES: S.THERMOPHILUS, L.BULGARICUS, L.ACIDOPHILUS AND BIFIDOBACTERIA.
CONTAINS ALMONDS
kite-hill.com


Nutrition Facts
Serving Size 1 Container
Amount Per Serving
Calories 180 Calories from Fat 100
% Daily Value*
Total Fat 11g 17%
Saturated Fat 1.5g 7%
Trans Fat 0g
Cholesterol 0mg 0%
Sodium 5mg 1%
Total Carbohydrate 15g 5%
Dietary Fiber 0g 0%
Sugars 14g
Protein 5g
Vitamin A 4% • Vitamin C 0%
Calcium 0% • Iron 0%
*Percent Daily Values (DV) are based on a 2,000 calorie diet.
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& Recycle
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TRADITIONALLY
CULTURED


ARTISAN ALMOND MILK YOGURT
kite hill
TRADITIONALLY CULTURED
SOY & DAIRY FREE
VANILLA
5x THE PROTEIN OF COCONUT YOGURT*
*CONTAINS 5G PROTEIN PER 5.3 OZ SERVING COMPARED TO 1G PROTEIN IN THE LEADING COCONUT YOGURT

EXHIBIT B

November 2, 2001

Christine J. Lewis, Ph.D.
Director
Office of Nutritional Products, Labeling, and
Dietary Supplements
HFS-800
Center for Food Safety and Applied Nutrition
Food and Drug Administration
200 C Street, S.W.
Washington, DC 20204

Re: Docket No. 97P-0078

Dear Dr. Lewis:

The National Milk Producers Federation ("NMPF") submits this correspondence and comment in an effort to focus and motivate agency decisionmaking regarding the labeling of "soymilk" products. This is not an incidental or minor matter: soy beverage sales accounted for hundreds of millions of dollars last year. Resolving, clearly and in a timely manner, how soy beverage products should be labeled in order to ensure that consumers' expectations are being met should be of high priority to the Center.

You are familiar with this matter. On February 27, 1997, the Soyfoods Association of America filed a citizen petition to establish a common or usual name for "soymilk" and related names. Concerned about the proliferation of what we believe are mislabeled "soymilk" beverages, we submitted to the Center on February 14, 2000 a trade complaint about the use of terms like "soymilk." Our complaint sought prompt and appropriate agency action in policing the marketplace in an effort to promote honesty and fair dealing in the interests of

consumers.[1] On April 21, 2000 you responded to our urgings by saying that our letter would be included as part of the docket to the Soyfoods Association petition and that although that petition was not of high priority, you hoped to address the issue in the "near future."

There is no indication that the petition has been given any meaningful Center priority or that the issue is likely to be resolved any time soon. Meanwhile, soy beverage manufacturers have been free to market "soymilk" products designed to look like milk, to taste like milk, to be packaged like milk, and to be used like milk. Not only are these products not clearly distinguished from milk, they are specifically marketed to resemble it.

By this letter, we would like to plead our case further: at a minimum, many currently marketed "soymilk" products are misbranded under the Food, Drug, and Cosmetic Act ("the Act"); failure to address this unlawful activity not only is at odds with the interests of consumers but also is at odds with FDA's efforts over the years to enhance the value and reliability of the food label. And lastly, FDA's failure works to erode the integrity of dairy products. We ask that this correspondence be treated as a formal, and wholly necessary, comment on the Soyfoods Association petition.

Historical and Legal Context

Labeling Foods Resembling Standardized Foods. "Milk" is a standardized food.[2] FDA's legal authority to establish and enforce standards of identity is straightforward. The text and legislative history of Section 401 reveal that the food standard requirement was designed to maintain "the integrity of food products" and ensure that foods met "the expectation of the buyer."[3]

Section 403(g) of the Act renders misbranded any product that "purports to be or is represented as" a food for which a standard has been established and whose composition deviates from the standard. Foods that do not purport to be and are not represented as standardized are not excluded from the

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[1] A copy of our February 14, 2000 letter is attached and incorporated by reference into this correspondence.

[2] "Milk" is defined in 21 C.F.R. 131.110(a) as "the lacteal secretion, practically free of colostrum, obtained by the complete milking of one or more healthy cows." The definition goes on to further define "milk" in terms of milk solids, percent milk fat and by possible added ingredients.

[3] C.W. Dunn, Federal Food, Drug, and Cosmetic Act: A Statement of Its Legislative Record 1072 (1938) (Statement of Walter G. Campbell, Chief, Food and Drug Administration, at Hearings on S. 2800).

marketplace provided they bear an apt common or usual name. *See* Section 403(i). A "common or usual" name cannot be false or misleading and, to this end, "may not be confusingly similar to the name of any other food that is reasonably encompassed within the same name."[4] The enforcement scheme thus presented reveals the Congressional intent that although food standards should not serve as a gate keeping device to preclude the introduction of new food products, they should serve as a means of ensuring that consumers get what they think they are getting when they purchase certain foods.

FDA has traditionally given Section 403(g) an expansive interpretation. Early agency enforcement actions against substitutes for standardized foods involve circumstances where there was little likelihood that consumers would confuse a given product with a standardized food. The cases suggest that mere similarity in appearance and commonality of use are sufficient to meet the "purports to be" standard.[5]

In addition to Sections 403(g) and (i), FDA has relied on Section 403(c) as an enforcement tool in this area. Section 403(c) deems a food misbranded "if it is an imitation of another food unless its label bears … the word 'imitation' …." Relying on this section, FDA for years routinely sought to require imitation labeling on foods that resembled standardized foods but did not conform in every respect to the standard.[6]

In the early 1970's, FDA began to move away from expansive and rigid interpretations of Sections 403(c) and 403(g). This shift was precipitated by significant advancements in the field of food technology. FDA began to develop principles concerning the marketing of substitutes for traditional foods, standardized as well as non-standardized, and articulated them in regulations and accompanying preambles concerning "imitation" labeling and the establishment of "common or usual names."[7] With these regulations FDA adopted a practical, common sense approach to naming new foods that substitute for standardized

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[4] 21 C.F.R. §102.5(a).

[5] *See also, e.g., United States v. 30 Cases … Strawberry Fruit Spread*, 93 F. Supp. 764 (S.D. Ohio 1950) (product labeled as "fruit spread" found to "purport to be" standardized strawberry preserves"). Obviously, there are limits to any expansive reading: a food labeled "imitation jam" was held not to "purport to be" jam even though it resembled it. *62 Cases of Jam …v. United States*, 340 U.S. 593 (1951).

[6] *See* Merrill, R.A. et al., *Like Mother Used to Make: An Analysis of Food Standards of Identity*, 74 Colum. L. Rev. 561, 577-81 (1974).

[7] For a discussion of this history, *see Federation of Homemakers v. Schmidt*, 539 F.2d 740, 741-43 (D.C. Cir. 1976).

ones. Acknowledging that any food that "purports to be or is represented as" a standardized food but fails to conform to the standard is misbranded under 403(g), FDA went on to acknowledge that "a substitute for a standardized food may properly be labeled with a distinctive common or usual name or descriptive term or phrase *if it is sufficiently informative to prevent confusion with the standardized product*."[8] Simply put, in deciding the lawfulness of the labeling of a food that resembles a standardized food, words matter.

Labeling Non-Dairy Products That Resemble Standardized Dairy Foods. Throughout the years, numerous non-dairy products have attempted to benefit from the consumer's expectations associated with dairy products. In response to these efforts, in 1978 FDA proposed a standard of identity regulation for milk and cream substitutes and cheese and cheese product substitutes.[9] The proposal was controversial and, not surprisingly, the comments evidenced a lack of agreement throughout the food industry regarding the most appropriate nomenclature for milk, cream, and cheese substitutes. The agency, thus, withdrew the proposal in 1983.[10] In so doing, however, the agency provided guidance concerning how to ensure that the name of a dairy-substitute food is not misleading. First, the agency observed that the name should *ordinarily not* include the name of a product subject to a standard of identity *unless* it complies with the standard of identity or it is nutritionally inferior to the food and is labeled with the term "imitation."[11] Next, the agency acknowledged that in some cases it may be reasonable and appropriate to include the name of a standardized food or other traditional food in the name of a substitute food in order to provide the consumer with an accurate description but that, when this is done, the name of the food must be modified such that the nature of the substitute food is "clearly described and is clearly distinguished from the food which it resembles and for which it is intended to substitute."[12] The agency went on to note that the modification of the name of the traditional or standardized food "must be descriptive of *all* differences that are not apparent to the consumer."[13] Thus, the procedure for naming depends on the nature of the non-dairy food and the manner and extent to which it differs from the food it simulates. There has been no formal change, to our knowledge, to this fundamental agency guidance.

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[8] 38 Fed. Reg. at 20702, 20703 (August 2, 1973) (emphasis added).
[9] 43 Fed. Reg. 42118 (September 19, 1978).
[10] 48 Fed. Reg. 37666 (August 19, 1983).
[11] *Id.* at 37667.
[12] *Id.*
[13] *Id.* (emphasis added).

The Soyfoods Association 1997 Petition

The Soyfoods Association petition seeks a common or usual name in an effort to provide formal protection from any claim that "soymilk" and related terms that purport to be the standardized food, "milk." The petition contends that terms like "soymilk" and "soy milk" have been used to describe the liquid food derived from the cooking and processing of whole soybeans since the early decades of the past century. A good deal of information cited in support of the petition comes from USDA publications directed primarily at establishing basic food composition tables. These references, of course, do not establish one way or another a consumer's understanding of the term "soymilk." Other references in the petition are from publications of the American Soybean Association ("ASA") documenting that certain "soy beverages" (ASA's terminology) have been referred to over the years as "soymilk" or "soy milk." The petition also contains a Soyfoods Association document, "Voluntary Standards for the Composition and Labeling of Soymilk in the United States" which contains a history of the terminology of "soymilk" and "soy milk." Of particular interest is the fact that the history describes the soymilk drinks in this country in the early 1980's as "bland tasting soymilk in a long life package."

It is not fully clear from any of these documents precisely how these early soy beverages were marketed or used. Although a 1986 USDA reference makes clear that there were then a number of soy beverage uses, including in infant formulas, the marketing of soy beverages that are specifically designed not only to replace milk but also to look and taste like milk appears to be a relatively recent phenomenon. In fact, the "bland-tasting" soymilk "long life packaged" dairy cow alternative product noted by the Soybean Association's 1986 report appears to be a far cry from products currently on the market. This distinction is captured in a very recent article by Steven Demos, the CEO of White Wave, Inc., the manufacturer of the "soymilk" "Silk."[14] In the article Mr. Demos explains the company's efforts to develop a strategy to market "soymilk." In the article he explains that when White Wave introduced "Silk" in 1996, the company was doing just over $6 million in business, presumably from all its soy products. The Company now does over $140 million in business. Mr. Demos explains that the ultimate way of changing how consumers perceived what had been marketed as soymilk beverages to that point was to "leverage familiarity" and associate the soy product with milk:

> We also had to figure out how to get this product category to market. Dairy milk is a staple food that we consider a fundamental

[14] Demos, Steven, "Got Soy," Hemisphere Magazine, August 2001, pp. 21-26.

> part of the scenery in a supermarket. *Why not position fresh soymilk to be as close as possible*?[15]

The labeling practices of White Wave and similar manufacturers reveal an intentional effort to market "soymilk" and related products so as to look and taste like "milk." Many of these products, like Silk, are flavored, colored white, placed in traditional gabled cardboard containers and sold alongside milk in refrigerated grocery store shelves. Vignettes on cartons and in product advertising show it being used in conventional milk applications (in breakfast cereal, for example). In all likelihood, the "soymilk" that has been marketed over the last five years bears little resemblance to the "bland" products employing that name in years past. Gone is the "beanie" flavored light brown product and, in its place, are whitened, flavored, textured products clearly designed to look, taste, and be used like milk. While the Soyfoods Association petition does not in our view establish the common, lawful usage in the past of terms like "soymilk" in general, it surely does not establish that usage on *currently* marketed "soymilks."

Of particular concern is the petition's glib dismissal in footnote 10 of FDA's past positions with regard to the use of the term "soymilk."[16] FDA's correspondence concerning soymilk issues in the past is not extensive, but it has been consistent with the legal precedents discussed above. The letters clearly reflect FDA's view during the 1980's that the term "soymilk" was, at a minimum, of problematic lawfulness and that more descriptive terms such as "soy bean drink," "soy drink," or "soy beverage" were appropriate alternatives. Moreover, as the foregoing discussion reveals, these products were arguably more distinguishable for the consumer from the line of "soymilk" products marketed today and subject to the Soyfoods Association petition. Clearly, FDA's concerns, as articulated in the agency's past correspondence on this topic, cannot be as lightly dismissed as the Soyfoods Association would like.

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[15] *Id.* at 25 (emphasis added).

[16] Copies of the following correspondence are attached: January 23, 1981 Letter from J. L. Summers, Assistant to the Director, Division of Regulatory Guidance, Bureau of Foods to Eisuke Murakami, President, K. Tanaka & Company, Inc.; Letter dated September 29, 1983 from James R. Taylor, Jr., Assistant to the Director, Division of Regulatory Guidance, Bureau of Foods to Mr. Kok Ee Lynn, Senior Officer, Singapore Institute of Standards and Industrial Research; and Letter dated July 18, 1985 from Lillie Taylor, Assistant to the Director, Division of Regulatory Guidance, CFSAN to C. Hwang, Dr. Chung's Foods Company, Ltd.

Even if the agency were disposed to reconsider whether the term "soymilk" could be used instead of a term like "soy beverage," FDA's position has been (as the agency's 1983 guidance noted above reveals) that when the name of a standardized food is included in the name of a non-standardized product, the name must be modified in such a way that the nature of the substitute food is clearly described and distinguished from the food which it resembles and must describe all the differences not apparent to the consumer. For this reason, coffee "creamer" products that do not contain "cream" must be clearly labeled, e.g., "non-dairy creamers."[17] No less a qualification would be appropriate for products like the current soy beverage type milk substitutes -- products specifically marketed to resemble milk. In such a case, the non-dairy status of these products must, at a minimum, be made absolutely clear. The Soyfoods Association petition fails to dwell and focus on this critical point.

In sum, extensive agency precedent is at odds with the gravamen of the Soyfoods Association petition and with the current unencumbered marketing of "soymilk" products.

Meeting Consumer Expectations, Continued Agency Inaction and the Role of the Food Label

A recent study reported and conducted by Arthur D. Little[18] reveals that "soymilk" products are not minor "niche" products: soy beverages sales accounted for approximately $422 million last year and are expected to grow to $1 billion by 2005. The study is the result of an alliance between the U.S. soy beverage industry and Arthur D. Little to help boost product growth and to lead to improvements "in taste and texture, formulation, merchandising, branding, positioning, manufacturing, food safety, and commercialization" in relation to soy beverages.[19] The study concludes, however, that soy beverages currently on the market do *not* meet consumer standards for flavor quality and flavor consistency, i.e., that soy beverages do not deliver to consumers the attributes of "milk." Soy beverage manufacturers continue to market their products not only as substitutes for milk but also as resembling milk.

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[17] Most common products that bear the term "milk" are clearly distinguished from "milk." For example, "goat's milk ice cream" is a standardized product (21 C.F.R. § 135.115) and other "goat's milk" products clearly designate the sources and nature (lacteal) of the "milk." Other products, such as "coconut milk," do not attempt to directly compete with the traditional fluid beverage milk and are not portrayed as resembling "milk."

[18] An article describing the study is attached.

[19] Press Release, April 11, 2001: "Arthur D. Little and Soya Tech Form Alliance to Propel Soy Foods into Mainstream and Market" (copy attached).

While soy beverage manufacturers position their products as close to milk as possible, the agency refuses to take even nominal steps to ensure that soy beverages are clearly differentiated from milk and milk products. And unfortunately, the agency's express refusal to take action on NMPF's trade complaint because of the pendency of the Soyfoods Association petition just serves to foster and encourage the kinds of inappropriate labeling practices that, for good reason, have troubled the agency in the past.

This failure is wholly inconsistent not only with traditional statutory-based agency practice but also with one of FDA's most significant accomplishments of the 1990's: the agency's massive effort to implement the Nutrition Labeling and Education Act ("NLEA") and, in the process, to enhance the value and reliability of the food label. The NLEA was designed by Congress to provide meaningful information about foods and to convey that information on the food label in a simple, clear manner. The ultimate goal of the NLEA reforms, reforms which FDA has led the government in advocating, was to enable consumers to choose foods more wisely. These goals will be achieved only if consumers can understand the information on food labels. *From the outset, both Congress and FDA recognized that food labels should contain essential information about the identity and quality of food*. Moreover, the NLEA itself was designed not simply to require new information on food labels, but to prevent food labels from becoming a morass of unintelligible information. By not acting to require soy beverage manufacturers to clearly and informatively label their products, the Center appears to be abandoning the discipline essential to the fundamental labeling goals it worked so hard to establish in implementing the NLEA.

Conclusion

For all of the foregoing reasons, NMPF urges the agency to focus on the issues presented by "soymilk" labeling. We further urge that the agency conclude, as it has in the past, that the term "soymilk" and terms like it are, in light of the fact that milk is a standardized food, at odds with the requirements of Section 403(g) of the Act and that terms such as "soy beverage" or "soy drink" must be used in their stead. In the alternative, we urge the agency, at a minimum, to adhere to its 1983 guidance concerning the name of milk substitute products and recognize that the term "soymilk" and terms like it do not adequately describe to consumers all the differences between soy beverages and milk and milk products and that, as such, the use of terms like "soymilk" is inconsistent with Sections 403(c) and (i) of the Act. To this end, we request the agency to consider the type of language that would render the use of the term "soymilk" and related terms consistent with the statutory requirements and require the conspicuous and

prominent use of that language (e.g., “non-dairy”) as part of the name of any “soymilk” product. Lastly, we ask the agency to act promptly and decisively to stop the labeling practices about which we complain.

These requests are wholly consistent with agency precedent, statutory requirements, and the facts. And, these requests square well with FDA’s fundamental efforts in recent years to ensure that the food label is, and remains, a source of meaningful information for consumers.

Sincerely,

Robert D. Byrne, Ph.D.
Vice President of Regulatory Affairs

EXHIBIT C

National Milk Producers Federation

National Milk Producers Federation · 2101 Wilson Blvd., Arlington, VA 22201 · 703-243-6111 FAX 703-841-9328

February 14, 2000

Joseph A. Levitt, Director (HFS-001)
Center for Food Safety and Applied Nutrition
U.S. Food and Drug Administration
200 C Street SW, Room 6815
Washington, DC 20204

Dear Mr. Levitt:

The National Milk Producers Federation (NMPF) wishes to register a trade complaint concerning what we believe to be the rapidly expanding misuse of the name of a standardized food in the labeling of certain food products. In submitting this complaint, NMPF is requesting that FDA take appropriate enforcement action to prevent misbranded products from entering the marketplace and to promote honesty and fair dealing in the interest of consumers.

The National Milk Producers Federation, headquartered in Arlington, VA, develops and carries out policies that advance the well-being of U.S. dairy producers and the cooperatives they collectively own. The members of NMPF's 26 cooperatives produce the majority of the U.S. milk supply, making NMPF the voice of 50,000 dairy producers on Capitol Hill and with government agencies.

Recently, NMPF has observed a growing number of beverages on the store shelves in the Washington, DC area and elsewhere which we feel are misbranded. We have also received a number of trade complaints from our member cooperatives throughout the U.S. regarding these same types of products. The products referenced are various soy-based beverages which are inappropriately using the name of a standardized food (i.e., "milk") on the label for their products. The term "milk" is appearing not only in the name of the food, but also in the ingredient statement and supporting information on the label. On occasion, other cereal or grain-based (e.g., rice or oat) non-dairy beverages also use the term "milk" in their labeling, but our marketplace information has shown this practice is not as common within these segments as it is within the soy beverage industry.

Milk as a standardized food is very clearly described in the standard of identity under 21 CFR 131.110 (a) as follows:

> Milk is the lacteal secretion, practically free from colostrum, obtained by the complete milking of one or more healthy cows. Milk that is in the final package form for beverage use shall have been pasteurized or ultrapasteurized, and shall contain not less than 8¼ percent milk solids not fat and not less than 3¼ percent milkfat. Milk may have been adjusted by separating part of the milkfat therefrom, or by adding thereto cream, concentrated milk, dry whole milk, skim milk, concentrated skim milk, or nonfat dry milk. Milk may be homogenized.

In the view of NMPF, any product which uses the term "milk" as part of the name of the food on the label, therefore, must comply with the above standard of identity. Of course, the use of the term "milk" from non-bovine species is also well established and referenced in other standards of identity (e.g., goats milk ice cream). NMPF contends that this allowance for milk from non-bovine animals was never intended to include soy mixtures, it is merely recognition that other species of animals provide milk through lactation.

NMPF also recognizes that some products, such as coconut milk, have a well-established historical use of the term "milk" in their nomenclature. These products, however, do not attempt to directly compete with traditional fluid beverage milk (from milking animals) in the market place. Soy-based beverages, on the other hand, are attempting to directly compete with dairy products and are inappropriately taking advantage of the familiarity (and positive image) of dairy terminology in their labeling.

In regard to ingredient labeling, FDA has provided for some grouping of dairy products for the purpose of labeling. These regulations are described in 21 CFR 101.4 (b) (4) as follows:

> Milk, concentrated milk, reconstituted milk, and dry whole milk may be declared as "milk".

Consequently, NMPF would maintain that any product which is not milk as defined in 21 CFR 131.110 and which uses the term "milk" as an ingredient, therefore, must comply with the above ingredient declaration requirements. Since soy protein is not listed in the above regulation, it may not be declared as "milk" in the ingredient listing.

Historically, non-dairy beverage products have been primarily sold in limited quantities in specialty supermarkets and health food stores. However, many of these products have recently been appearing in main stream, major grocery chains. With the

recent promulgation of 21 CFR 101.82 *Health claims: Soy protein and risk of coronary heart disease* by FDA, this trend can only be expected to increase.

In many instances, these soy-based beverage products are positioned on the grocery shelf alongside milk and other dairy products in a clear attempt to compete with dairy products as a beverage. In addition, the labeling of soy beverages and accompanying marketing language attempt to portray to consumers that these products are, in fact, dairy-like products by using the term "milk" on the label. In fact, the labeling and accompanying graphics for such products often directly depict the appearance and customary labeling of milk (e.g., "1% LOWFAT").

NMPF believes that these soy-based beverage products are, at best, imitations or substitutes, as defined in 21 CFR 101.3 (e) and must be prominently labeled as such if they are to continue to use the term "milk" as part of the fanciful name for the products. NMPF believes that the true common or usual name for these products is "Soy beverage" or "Soya drink", since they have traditionally been marketed as such, and, in fact, many firms continue to do so. In fact, as noted earlier, many similar product manufacturers, such as rice and oat beverage firms, comply with the regulations in the labeling of their products.

Although some non-dairy beverages may resemble cow's milk in appearance, they are very different in nutritional value and composition from the standardized product described as milk in 21 CFR 131.110. NMPF believes that the food described in the standard of identity is the food that most consumers in the U.S. customarily consider as "milk". These soy beverage products are certainly not the lacteal secretion from cows as described and required by the standard of identity, but rather a formulated liquid extracted from soybeans and water. Soy beverages are a creamy-white emulsion resembling milk in appearance, but are made from dried soybeans. In addition, these products are nutritionally inferior to milk, as they lack the appropriate level of protein when compared to milk products. One serving of milk provides 8g of protein whereas one serving of soy beverage in the examples enclosed only contains 4-7g of protein. Nutritional inferiority is defined by the Agency as any reduction in the content of an essential nutrient. Protein is an essential nutrient that is clearly lacking in these soy beverages.

In summary, NMPF requests that FDA take appropriate regulatory action necessary to bring these violative products into compliance with the appropriate labeling regulations. Our complaint is regarding the rise of fraudulent labeling and marketing of an expanding number of products labeled as "soymilk". This practice is in direct violation of the Food Drug and Cosmetic Act, Sections 403 (a), (b), (c), and (g) and Sections 301 (a) and (g).

In order to assist you with this request and to provide evidence of these misbranded products, enclosed are examples of violative cartons of soy beverages which include the use of the term "soymilk" as the name of the food, on the principal display panel, and in the ingredient statement. NMPF respectfully requests that the

Agency take immediate regulatory action to correct this improper labeling situation before this practice becomes more pervasive in the soy-based beverage industry.

Thank you for your prompt attention to this matter. Please feel free to contact me if you have any questions or if further information is needed.

Sincerely,

Robert D. Byrne

Robert D. Byrne, Ph.D.
Vice President of Regulatory Affairs

Enclosures

Cc: Janice F. Oliver, Deputy Director for Operations
Christine J. Lewis, Acting Director, Office of Nutritional Products, Labeling, and Dietary Supplements
Joseph M. Smucker, Chief, Milk Safety Team

EXHIBIT D

FSIS Case No. 2018-_____
Total No. of Pages: 124

BEFORE THE
UNITED STATES DEPARTMENT OF
AGRICULTURE, FOOD SAFETY AND INSPECTION
SERVICE (FSIS)

In the matter of

BEEF AND MEAT LABELING REQUIREMENTS: TO EXCLUDE PRODUCTS NOT DERIVED DIRECTLY FROM ANIMALS RAISED AND SLAUGHTERED FROM THE DEFINITION OF "BEEF" AND "MEAT"

PETITION FOR THE IMPOSITION OF BEEF AND MEAT LABELING REQUIREMENTS: TO EXCLUDE PRODUCTS NOT DERIVED DIRECTLY FROM ANIMALS RAISED AND SLAUGHTERED FROM THE DEFINITION OF "BEEF" AND "MEAT"

Petitioner:

U.S. CATTLEMEN'S ASSOCIATION (USCA)

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Date: February 9, 2018

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PETITION FOR THE IMPOSITION OF BEEF AND MEAT LABELING REQUIREMENTS: TO EXCLUDE PRODUCT NOT DERIVED DIRECTLY FROM ANIMALS RAISED AND SLAUGHTERED FROM THE DEFINITION OF "BEEF" AND "MEAT"

FSIS Docket Clerk
United States Department of Agriculture
Food Safety and Inspection Service (FSIS)
Room 2534 South Building
1400 Independence Ave., SW
Washington, DC 20250-3700

Re: Petition to Establish Beef and Meat Labeling Requirements: To Exclude Product Not Derived Directly from Animals Raised and Slaughtered from the Definition of "Beef" and "Meat"

Dear Docket Clerk,

The U.S. Cattlemen's Association (USCA) respectfully submits this petition requesting that the Department of Agriculture, Food Safety and Inspection Service (FSIS) establish certain beef labeling requirements. Our request is consistent with FSIS's current policy towards the labeling of beef, but further addresses specific additional concerns.

USCA has long advocated for additional beef labeling requirements to better inform consumers. There are currently no labeling requirements applicable to products labelled as "beef" or more broadly as "meat" mandated by law.

USCA has learned that some major U.S. meatpackers and companies in other countries are heavily investing in creating alternative products that may resemble in appearance and taste beef products, including synthetic "beef" and "beef" grown in laboratories using animal cells, known as "*in vitro*" meat, "bio meat," "clean meat," or "cultured meat." Such products, which are *not* derived from animals born, raised, and harvested in the traditional manner, should *not* be permitted to be marketed as "beef," or more broadly as "meat" products.

The labels of "beef" or "meat" should inform consumers that the product is derived naturally from animals as opposed to alternative proteins such as plants and insects or artificially grown in a laboratory. Alternative products such as those described above should thus not be permitted to be labeled as "beef," which is widely understood by consumers to be the flesh of a bovine animal, such as cattle, harvested for use as food, or

as "meat," which is understood to be derived from animal tissue or flesh for use as food. *See* **Collective Exhibit 1** (definitions of "beef," "meat," and related terms).

Indeed, to eliminate the likelihood of confusion and to better inform consumers, USCA contends that labels indicating that a product is "beef" should be limited to product from cattle that have been born, raised, and harvested in the traditional manner. Similarly, products that are labeled as "meat" should be limited to those that are derived from the tissue or flesh of an animal harvested in the traditional manner. As such, USCA requests that FSIS exclude man-made or artificially manufactured products that are not derived from animals born, raised, and harvested in the traditional manner from the definition of both beef and meat. This includes synthetic products from plant, insects, and other non-animal components, as well as any product grown in labs from animal cells.

Pursuant to the statutory and regulatory procedures for filing a petitions with the FSIS, the required information and supporting documentation are provided herein and below. *See* 5 U.S.C. § 553(e); *see also* 7 C.F.R. § 1.28; 9 C.F.R. § 392 & §§ 392.3-392.4.

I. STATEMENT OF THE ACTION REQUESTED

USCA requests that FSIS limit the definition of beef to product from cattle born, raised, and harvested in the traditional manner. Specifically, FSIS should require that any product labeled as "beef" come from cattle that have been born, raised, and harvested in the traditional manner, rather than coming from alternative sources such as a synthetic product from plant, insects, or other non-animal components and any product grown in labs from animal cells.

USCA further requests that the broader definition of "meat" also be limited to the tissue or flesh of animals that have been harvested in the traditional manner. This would similarly prohibit product from alternative sources such as a synthetic product from plant, insects, or other non-animal components and any product grown in labs from animal cells from being labeled as "meat."

The requested definition of "beef" and "meat" should be applicable to all products that use or might use the designation "beef" (or "meat" when marketed as a beef product) regardless of the country of origin. In other words, the definitions should not be limited to just U.S. product.

The above definitions should be added to the FSIS' Food Standards and Labeling Policy Book. The Policy Book, which may be updated to reflect current policy developments, is "intended to be guidance to help manufacturers and prepare product labels that are truthful and not misleading." *See* "Food Standards and Labeling Policy Book," U.S. Department of Agriculture, Food Safety and Inspection Service, Office of Policy, Program and Employee Development (Aug. 2005) ("FSIS Policy Book") at Preface, excerpts included in **Exhibit 2** attached hereto.

II. STATEMENT OF INTEREST

USCA is a national organization committed to presenting an effective voice for the U.S. cattle industry and promoting ranching in the United States. USCA is committed to promoting the interests of cattlemen in the United States on issues including the creation and maintenance of the Country of Origin Labeling program, the implementation of a national system of animal disease traceability, and ongoing work to address necessary reforms within the mandatory Beef Checkoff program. USCA is a non-profit corporation registered in Montana with members in twenty-seven states nationwide.

USCA's members include, among others, cow-calf operators, backgrounders, and independent feedlots. Cow-calf operators are ranchers and farmers who have herds of mother cows and who handle calves from birth to the weaning stage, typically five to ten months. Backgrounders, also known as stocker/yearling operators, are ranchers and farmers who handle cattle after the cow-calf stage up to the point of having cattle ready for final finishing at a feedlot, typically until twelve to twenty months of age. Feedlots finish cattle in terms of weight gain for the final three to five months and hold cattle until purchase by slaughterers. Some ranchers are involved in more than one stage (*e.g.*, may raise a calf from birth to fully finished and ready to go to the packing plant). In a born/raised/slaughtered information system, USCA members are involved in the born and/or raised phases.

USCA is concerned with the recent introduction and development of alternative products that are being marketed or may be marketed as though they are "beef". Synthetic products, comprised of plants, insects and other components *not* from animals, are already being sold in restaurants and retail markets as a form of "beef" or meat product. Additional products, most notably products grown in laboratories from animal cells, are under development. Though initial costs for these products were exorbitantly high, costs are rapidly decreasing and lab produced "beef" products are expected to be commercially sold by 2020.

Consistent with USCA's long standing position, USCA maintains that the FSIS should define "beef" (and "meat" when marketed as a beef product) as product from cattle born, raised, and harvested in the traditional manner to exclude any and all alternative products from using the term when not so derived.

III. STATEMENT OF THE GROUNDS FOR GRANTING THE PETITION

A. Legal Basis for Requested Actions

U.S. citizens have the right to petition the government to add, amend, or repeal rules under the Administrative Procedure Act (5 U.S.C. § 553(e)). Citizens may petition to amend U.S. Department of Agriculture (USDA) rules specifically under 7 C.F.R. § 1.28 and 9 C.F.R. § 392.

FSIS has primary responsibility for the regulation of food labeling for meat producers under the Federal Meat Inspection Act (FMIA). The FMIA states that meat or meat food

products shall be "misbranded" if its "labeling is false or misleading in any particular." *See* 21 U.S.C. § 601(n)(1).

Products are considered to be mislabeled where, amongst other things, they are "offered for sale under the name of another food," are "an imitation of another food, unless {the} label bears, in type of uniform size and prominence, the word 'imitation' and immediately thereafter, the name of the food imitated," or "purports to be or is represented as a food for which a definition and standard of identity or composition has been prescribed by regulations" without conforming to the applicable definition and standard. *Id.* at § 601(n)(2)-(3), (7).

FSIS regulations for the "labeling and preparation of standardized products" further provide that "{a}ny product for which there is a common or usual name must consist of ingredients and be prepared by the use of procedures common or usual to such products{.}" *See* 9 C.F.R. § 319.1.

Currently, FSIS regulations at 9 C.F.R. §§ 412.1 – 412.2 require that modifications to the labeling requirements be submitted to the FSIS for approval. The FSIS considers labeling claims for meat on a case-by-case basis.

Pursuant to this legal authority, USCA requests that the Secretary of Agriculture make the aforementioned changes to the Food Standards and Labeling Policy Book outlined in the Statement of Action Requested. *See* Section I, *supra.*

B. Consumer Perceptions With Respect to Alternative Products Labeled as "Beef" or "Meat"

Current labeling practices may cause consumer confusion in the market place. To demonstrate consumer perceptions with respect to "beef" and "meat," we first explain the definition of the terms as proffered by a variety of sources including common dictionary definitions and the U.S. Department of Agriculture (USDA), which are widely understood by consumers. We next present the Federal Trade Commission's "Truth in Advertising" standard, which requires that advertisements be truthful, not misleading, and, where possible, backed by scientific evidence. Finally, we show the facial confusion caused by current labeling practices based on recent articles, advertisements, and menus, as well as U.S. Food and Drug Administration (FDA) precedent.

i. The Definitions of "Beef" and "Meat"

Beef, meat, and related products have been defined by a variety of sources, including dictionaries, U.S. statute, and the USDA's Agriculture and Marketing Service (AMS) and FSIS regulations. *See* **Collective Exhibit 1** (definitions of "beef," "meat," and related terms). These definitions are not applicable to alternative products, which, as discussed in more detail below, are not derived from animals harvested in the traditional manner.

1. Common dictionary definitions

Common dictionary definitions of the term "beef" indicate that the term refers to the meat of a slaughtered bovine animal. Specifically, the Merriam-Webster Dictionary defines beef as "the flesh of an adult domestic bovine (such as a steer or cow) used as food," or alternatively as "a steer or cow fattened." *See Beef Definition*, Merriam-Webster.com (last visited Jan. 29, 2018), part of **Collective Exhibit 1**. Oxford Dictionary similarly defines beef as "flesh of a cow, bull, or ox, used as food" or "{a} cow, bull, or ox fattened for its meat." *See Beef Definition*, OxfordDictionaries.com (last visited Jan. 29, 2018), part of **Collective Exhibit 1**. *Accord Beef Definition*, dictionary.cambridge.org (last visited Jan. 29, 2018) (defining "beef" as "the flesh of cattle eaten as meat"), part of **Collective Exhibit 1**.

Significantly, other dictionaries clarify that beef is derived from bovine animals that have been "killed" or "slaughtered" for their meat. *See, e.g., Beef Definition*, Dictionary.com (last visited Jan. 29, 2018) (defining beef as "the flesh of a cow, steer, or bull raised and *killed* for its meat"); *Beef Definition*, TheFreeDictionary.com (last visited Jan. 29, 2018) (defining beef as the "flesh of a *slaughtered* full-grown steer, bull, ox, or cow") (emphasis added), part of **Collective Exhibit 1**.

The aforementioned sources generally define "meat" as animal tissue or flesh used as food. *See, e.g., Meat Definition*, Merriam-Webster.com (last visited Jan. 30, 2018) ("animal tissue considered especially as food"); *Meat Definition*, OxfordDictionaries.com (last visited Jan. 30, 2018) ("flesh of an animal, typically a mammal or bird, as food"), part of **Collective Exhibit 1**.

The two alternative products highlighted above, *i.e.*, a synthetic product from plant and/or insects and a lab grown product from an animal cell, do not constitute "beef" or "meat" pursuant to these standard dictionary definitions. Indeed, in each definition discussed above, beef is defined as the derivative of a bovine animal, while meat is described as animal tissue or flesh. The synthetic product, however, is derived from plants, insects and other non-animal components. In addition, the definitions emphasize that beef is from fattened cattle that have been killed or slaughtered. Lab grown product, however, is artificially grown in a petri dish from animal cells. As such, these alternative products do not meet the traditional definition of "beef" or "meat" and are in fact marketed as vegan.

As previously noted, pursuant to FSIS regulations, "{a}ny product for which there is a common or usual name must consist of ingredients and be prepared by the use of procedures common or usual to such products{.}" *See* 9 C.F.R. § 319.1. The common names of "beef" and "meat" are widely understood by consumers to be the tissue or flesh of animals that have been slaughtered for food. As such, any products that are labeled as "beef" or "meat" that are neither derived from animals, nor slaughtered in the traditional manner are misbranded. If synthetic or lab grown "beef" is intended to be an imitation of traditional beef, it must be labeled as such. 21 U.S.C. § 601(n)(3).

2. Federal statutory and regulatory definitions

The definitions of "beef," "meat," and other related products, as set forth in federal statutes and regulations, are generally consistent with the standard dictionary definitions and supports USCA's position with respect to alternative products.

The term "meat food product" is defined in the Federal Meat Inspection Act (FMIA) as "any product capable of use as human food which is made wholly or in part from any meat or other portion of the carcass of any cattle, sheep, swine, or goats." *See* 21 U.S.C. § 601(j). "Prepared" meat refers to meat that has been "slaughtered, canned, salted, rendered, boned, cut up, or otherwise manufactured or processed." *Id.* at § 601(l).

USDA AMS regulations specifically define "beef" as the "flesh of cattle," which is in turn defined as "live domesticated bovine animals regardless of age." 7 C.F.R. § 1260.118-119. Beef products are defined in the AMS regulations as "edible products produced in whole or in part from beef{.}" 7 C.F.R. § 1260.120. Meat is more broadly defined by the AMS regulations as "the edible part of the muscle of any cattle, sheep, swine, or goats, which is skeletal or which is found in the tongue, in the diaphragm, in the heart, or in the esophagus, and which is intended for human food{.}" 7 C.F.R. § 98.2.

The USDA FSIS regulations further define specific beef products, including ground beef, hamburger, and beef patties. *See* 9 C.F.R. § 319.15. Specifically, ground beef is defined as "chopped fresh and/or frozen beef with or without seasoning and without the addition of beef fat{,}" while hamburger and beef patties are defined as "chopped fresh and/or frozen beef with or without the addition of beef fat as such and/or seasonings." *See id.* at 9 C.F.R. § 319.15(a)-(c).

Though the general term "beef" is not defined in the FSIS Policy Book, specific beef products, such as "beef a la mode," "beef and gravy," "beef burgundy or bourguignonne," "beef marsala," "beef roulade," and "beef slices a-la-pizzaiola," are included. *See* FSIS Policy Book at 9, 16, and 21, excerpts included in **Exhibit 2** attached hereto. The definitions of these and other beef products included in the Policy Book indicate a minimum percentage of beef content; for example, each of the aforementioned products must contain at least 50 percent beef. *Id.* Certain beef products defined by the Policy Book further contemplate that the bovine animal will be slaughtered. The term "aged beef," for example, is defined in part as beef "maintained in a fresh unfrozen state for a minimum of 14 days from the day of slaughter." *Id.* at 9.

The FSIS Policy Book likewise contains definitions of various meat products, such as "meat casseroles," "meat curry," "meat pies," "meat spreads," and "meatballs." *See* FSIS Policy Book at 106, and 108-10, excerpts included in **Exhibit 2** attached hereto. As with the various beef products outlined above, there are similar minimum meat percentage requirements for these meat products. *See id.*

As previously noted, a product is misbranded where it fails to conform to a definition or standard prescribed by regulation. *See* 21 U.S.C. § 601(n)(7). In this case, the

alternative products meet neither the statutory definition of "meat food product," nor the USDA regulatory definitions of beef, beef products, and meat. The synthetic product is comprised of plants, insects and other non-animal components and, as such, does not contain meat from the flesh of cattle or any other animal pursuant to the requirements in the definitions above. In addition, the lab grown product is not derived from cattle that have been slaughtered in the traditional manner, as contemplated by the definitions of beef products outlined in the FSIS Policy Book.

By way of analogy, the FDA has found similar vegan imitations of products to be misbranded when they purport to be the standardized food item as defined by the regulations. *See* **Collective Exhibit 3** attached hereto (FDA case precedent on vegan alternatives to standardized food items). Most notably, in 2015, the FDA issued a warning to Hampton Creek Foods for its use of a misleading name and imagery of a cracked egg on the labels of its vegan "Just Mayo" and "Just Mayo Sriracha" products. *See* "Hampton Creek Foods Warning Letter," FDA Department of Health and Human Services (Aug. 12, 2015), included in **Collective Exhibit 3** attached hereto. Specifically, the FDA found the company's use of the term "mayo" to be impermissible because the product did not contain eggs as required by the regulatory definition of "mayonnaise." *Id.* at ¶ 3. The FDA determined that the "{t}he use of the term 'mayo' in the product names and the image of an egg may be misleading to consumers because it may lead them to believe that the products are the standardized food, mayonnaise, which must contain eggs as described under {the regulations}." *Id.*

Though the company was ultimately allowed to continue using the trade name "Just Mayo," the FDA required it to "use bigger type on the front of the label for the list of product attributes like 'egg-free.'" *See* Stephanie Strom, "F.D.A. Allows Maker of Just Mayo to Keep Product's Name," NY Times (Dec. 17, 2015), included in **Collective Exhibit 3** attached hereto.

ii. Applicability of the FTC's "Truth in Advertising" Standard

The Federal Trade Commission (FTC) regulates unfair or deceptive acts, including false and misleading advertising of foods, drugs, devices, and cosmetics. *See* 15 U.S.C. § 52; *see also* **Collective Exhibit 4** attached hereto (explanation of the FTC's "Truth in Advertising" standard).

The FTC regulations prohibit advertisements for food products that are "misleading in a material respect." *See id.* at § 55(a)(1). As such, the FTC applies a "truth in advertising" standard, *i.e.*, ads must be "truthful, not misleading, and, when appropriate, backed by scientific evidence." *See* "Truth in Advertising," FTC.gov (last visited Jan. 29, 2018), part of **Collective Exhibit 4**. This standard is applicable to all advertisements, including ads that appear in newspapers and magazines, online, or on billboards. *Id.*

In determining whether an advertisement is misleading, the FTC will consider both "representations made or suggested by statement, word, design, device, sound, or any combination thereof," as well as "the extent to which the advertisement fails to reveal facts material in the light of such representations{.}" *See* 15 U.S.C. § 55(a)(1). The

FTC's "Policy Statement on Deception" further notes that an ad is deceptive if it is "likely to mislead consumers acting reasonably under the circumstances" and is "important to a consumer's decision to buy or use the product." *See* FTC Policy Statement on Deception (Oct. 14, 1983), part of **Collective Exhibit 4**.

The FTC has rigorously enforced its "truth in advertising" standard in context of food products, such as nutritional and dietary supplements and pet food. *See, e.g.,* Press Release, "Mars Petcare Settles False Advertising Charges Related to Its Eukanuba Dog Food," FTC.gov (Aug. 4, 2016); Press Release, "FTC Approves Final Consent Orders Settling Charges that Companies Deceptively Claimed Their Genetically Modified Nutritional Supplements Could Treat Diseases," FTC.gov (May 12, 2014), part of **Collective Exhibit 4**.

The FTC "truth in advertising" standard further supports USCA's position with respect to the alternative products reviewed. Specifically, the marketing of a plant-based burger as "beef" or "meat" is potentially deceptive because consumers would reasonably expect products labeled as such to be derived from animals slaughtered in the traditional manner. However, none of the alternative products derived from plants, insects or other non-animal sources and currently being sold in restaurants or grocery stores as a form of "burger" actually contain beef or any other meat, as it is defined by standard dictionaries, U.S. statutes, and USDA regulations. As demonstrated below, moreover, some of these synthetic products are being sold along-side traditional beef products in the market place, increasing the likelihood of consumer confusion.

iii. Labeling of Alternative Products as "Beef" and "Meat" in the Market Place

The absence of a definition of "beef" or "meat" and specific rules and parameters as to what constitutes them is resulting in mislabeling and may lead to consumer confusion. Without more stringent guidance as to what constitutes beef, such mislabeling will continue in the market place.

As previously noted, USCA is concerned with two categories of alternative products under development or currently being sold in the United States: (1) synthetic products made from alternative proteins, and (2) "lab grown beef" from animal cells, also known as "*in vitro*," "bio meat," "clean meat," or "cultured meat." Both categories of alternative products should not be permitted to use the "beef" label. These alternative products are *not* from an animal, born, raised and harvested in the traditional manner and, as such, do not meet the standard, statutory, and regulatory definitions of beef and beef products.

As discussed below, both the synthetic product and the lab grown product from animal cells directly compete, or will soon directly compete, against actual beef products that are born, raised and harvested in the traditional manner. *See* **Collective Exhibit 5** attached hereto (the development and labeling of the alternative products in the market place). Thus, in USCA's view both categories should be excluded from the definition of "beef."

Currently, there is no definition of what constitutes a "beef" or "meat" product. In light of the new market for synthetic products, new regulations should be adopted limiting the "beef" and "meat" labels to animals born raised, harvested, and processed in the traditional way.

1. Synthetic beef products

Synthetic products, which are derived from plants, insects and other non-animal components, are currently being sold in retail stores, specialty restaurants, and national chain restaurants.

One example of a synthetic product is one produced by Impossible Foods, which promotes "a plant-based burger that smells, tastes, looks and even feels like ground beef." *See* Matt Simon, "The Impossible Burger: Inside the Strange Science of the Fake Meat that 'Bleeds,'" Wired.com (Sept. 20, 2017), part of **Collective Exhibit 5**. On its website, Impossible Burger labels a photo of its meatless product, which is identical to raw ground beef in appearance, as "For the Love of Meat." *See* Impossible Burger, ImpossibleFoods.com (last visited Jan. 29, 2018), part of **Collective Exhibit 5**. As previously discussed, "meat food product{s}" are defined by statute as products "made wholly or in part from any meat or other portion of the carcass of any cattle, sheep, swine, or goats." *See* Section B.i.2., *supra; see also* 21 U.S.C. § 601(j). USDA regulations also define meat as "the edible part of the muscle of any cattle, sheep, swine, or goats, . . . which is intended for human food{.}" *See* Section B.i.2., *supra; see also* 7 C.F.R. § 98.2. Despite being labeled as such, the Impossible Burger does not contain meat as define by statute and USDA regulations.

Similarly, Southern California's Beyond Meat sells a "plant-based burger that looks, cooks, and tastes like a traditional burger" in retail stores and restaurant chains. *See* Jill Ettinger, "TGI Fridays to Run Meatless Monday Campaign After Vegan Burger Launch," Organicauthority.com (Jan. 9, 2018), part of **Collective Exhibit 5**. To directly compete with traditional beef products, Beyond Meat strategically merchandises its products adjacent to traditional meat in grocery stores. *Id.* Indeed, Beyond Meat's website shows that its burger patties are virtually indistinguishable when sold next to traditional ground beef. *See* "The Beyond Burger," BeyondMeat.com (last visited Jan. 29, 2018), part of **Collective Exhibit 5**. Like the Impossible Burger, Beyond Meat patties are labeled as "meat" even though they do not meet the statutory definition of a "meat food product," the regulatory definition of "meat," nor contain any meat as so defined. *See* Section B.i.2. *supra; see also* 21 U.S.C. § 601(j).

In addition, Beyond Meat sells "Beefy," "Beyond Beef Crumbles," which are advertised as a "beefy kick for any ground beef recipe." *See* "Products: Beyond Beef Crumble," BeyondMeat.com (last visited Jan. 29, 2018), part of **Collective Exhibit 5**. These products do not contain beef, but rather non-meat ingredients such as "Pea Protein Isolate," "Rice Flour," and "Yeast Extract." *Id.* As discussed above, USDA regulations define beef as the "flesh of cattle" and ground beef as "chopped fresh and/or frozen beef with or without seasoning and without the addition of beef fat{.}" *See* Section B.i.2. *supra; see also* 7 C.F.R. § 1260.119; 9 C.F.R. § 319.15(a). Beyond Beef

Crumbles do not comport with these regulatory definitions despite being labeled as "beef" and as a substitute for "ground beef." *Id.*

In addition, as with the FDA case involving Just Mayo and Just Mayo Sriracha products, where the labeling of eggless, vegan mayonnaise with imagery of a cracked egg was found to be misleading, Section B.i.2 *supra*, Beyond Beef labels its "Beyond Beef Crumble" with the image of a cow. *See* "Products: Beyond Beef Crumble," BeyondMeat.com (last visited Jan. 29, 2018), part of **Collective Exhibit 5**. For the same reasons and concerns articulated in the FDA mayo case, this label should not be permitted since it is misleading to consumers.

Fueled by investments from philanthropists like Bill Gates and traditional meat companies like Tyson Foods Inc., both Impossible Burger and Beyond Meat have rapidly expanded and are becoming more prevalent in the market place. *See* Shruti Singh, "Bill Gates and Richard Branson Back Startup That Grows 'Clean Meat,'" Bloomberg.com (Aug. 23, 2017), part of **Collective Exhibit 5**. For example, Impossible Burger is dramatically increasing its production capacity with a new factory that will have the capacity to produce 12 million pounds of burgers per year. *See* Adele Peters, "In Its New Factory, Impossible Foods Will Make 12 Million Pounds Of Plant-Based Burgers A Year," FastCompany.com (Mar. 29, 2017), part of **Collective Exhibit 5**. Likewise, Beyond Beef was recently added to the menu at more than 500 TGI Fridays chains nation-wide. *See* Jill Ettinger, "TGI Fridays to Run Meatless Monday Campaign After Vegan Burger Launch," Organicauthority.com (Jan. 9, 2018), part of **Collective Exhibit 5**. Notably, the TGI Fridays' menu simply lists "The Beyond Meat Cheeseburger" alongside traditional burgers with a picture that is indistinguishable from the other, traditional beef burgers on the menu. *See* TGI Fridays Menu, tgifridays.com (last visited Jan. 30, 2018), part of **Collective Exhibit 5**.

The proliferation of synthetic products is expected to continue, with an increasing number of synthetic products entering the market and displacing the market share of traditional beef products. Indeed, as noted in one article, "alternative proteins, such as insects ... are on the verge of becoming mainstream and 'stealing' growth from traditional meat products." Rebecca Howard, "Beef + Lamb explores 'alternative protein' options," nzherald.co.nz (Nov. 27, 2017), part of **Collective Exhibit 5**.

2. Lab grown product

Lab grown product from animal cells, also known as "*in vitro*," "bio meat," "clean meat," or "cultured meat," is a second category of non-beef product that is in development. *See, e.g.*, Rachel Roberts, "China signs $300m deal to buy lab-grown meat from Israel in move welcomed by vegans," Independent.co.uk (Sept. 2017), part of **Collective Exhibit 5**. Though lab grown product currently relies on animal cells, a totally synthetic substitute is being developed, which will cater to vegans. *Id.* In USCA's view, such artificially created products, regardless of whether derived from animal cells, should not be permissibly labeled as "beef," which is widely understood to be a derivative of cattle harvested in the traditional manner. *See* Section B.i.1., *supra.*

Though lab grown product is not yet available in restaurants or at the retail level, its development has been backed by prominent investors like Bill Gates and Cargill Inc. and, consequently, the cost of the lab grown product is becoming more commercially feasible. *See* Ido Efrati, "Israeli Institutions Working to Bring Cultured Meat From Lab to Plate," Haaretz.com (Apr. 30, 2017); Shruti Singh, "Bill Gates and Richard Branson Back Startup That Grows 'Clean Meat,'" Bloomberg.com (Aug. 23, 2017), part of **Collective Exhibit 5**.

Prominent producers of lab grown product include Memphis Meats and Mosa Meats, which seeks to create an $11 lab burger for commercial sale by 2020. *Id.*; *see also* "Where's the beef?: The market for alternative-protein products," Economist.com (Feb. 2, 2017), part of **Collective Exhibit 5**. Lab grown products are likely to become more prevalent in the market place and thus take market share from natural meat products harvested in the traditional manner.

USCA requests that any lab grown product (whether from an animal cell or from other sources) be excluded from the definition of "beef" and "meat."

IV. CONCLUSION

USCA has long advocated for additional beef labeling requirements to better inform consumers that beef is of U.S. origin. A closely related concern is what constitutes "beef" and "meat" more generally.

In recent years, there have been major investments in synthetic product and in products grown in laboratories using animal cells. Such products should *not* be permitted to be marketed as beef or as meat. This distinction should not be limited to just U.S. beef and meat, but rather applicable to all product regardless of the country of origin.

The "beef" and "meat" labels should inform consumers that the products are from animals harvested in the traditional manner, as opposed to derived from alternative proteins or artificially grown in laboratories. As such, the definitions of "beef" and "meat" should be limited to animals born, raised, and processed in the traditional manner, regardless of the country of origin. Synthetic products and products grown in labs from animal cells should thus not qualify to be labeled as "beef" or as "meat."

USCA requests that the Secretary of Agriculture make the aforementioned changes to the Food Standards and Labeling Policy Book.

Respectfully submitted,

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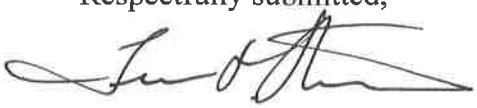
President, U.S. Cattlemen's Association (USCA)

Respectfully submitted,



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Counsel for U.S. Cattlemen's Association (USCA), Petitioner

Dated: February 9, 2018

EXHIBIT E

National Milk Producers Federation

2107 Wilson Blvd., Suite 600, Arlington, VA 22201 | (703) 243-6111 | www.nmpf.org

January 3, 2018

Stephen W. Beam, Ph.D.
Chief, Milk and Dairy Food Safety
California Department of Food and Agriculture
1220 N Street
Sacramento, CA 95814

Re: Kite Hill "Artisan Almond Milk Yogurt"

Dear Dr. Beam,

We write to call your attention to a line of so-called "Artisan Almond Milk Yogurt" products manufactured by Kite Hill and distributed by California-based Lyrical Foods, Inc., that are not only misbranded, but also falsely imply they are a suitable substitute for real dairy yogurt. When a food product's label attempts to skirt federal and state law, it is the obligation of regulators to rectify the situation.

Kite Hill's imitation "yogurt" product does not comply with the federal standard of identity for "yogurt" (21 CFR 131.200, and as referenced by California FAC 38731). The standard defines "yogurt" as produced by culturing cream, milk, partially skimmed milk, or skim milk, alone or in combination, with specific lactic acid bacteria. The standard does not include plant-based beverages among the required or optional ingredients that may be used in yogurt manufacture. Because this non-dairy product is labeled with the name of a standardized dairy food without conforming to the associated standard of identity, these products are misbranded.

Furthermore, Kite Hill's ploy to market its product using dairy food terminology can lead consumers to think its imitation "yogurt" is a nutritionally viable substitute for cow's milk yogurt. However, without real milk's many nutrients as a base, this fake yogurt product fails to deliver the same nutrition as the real thing. In fact, the Kite Hill product contains 40 percent more calories and 10 more grams of fat compared to an equivalent serving of vanilla yogurt, while at the same time offering one-third less protein and zero calcium.

According to federal labeling regulations, the name of the food must appear on the front label or principal display panel of a packaged food. In the absence of a name of the food established by law or regulation, the common or usual name of the food or an appropriate descriptive name, that is not misleading, should be used (21 CFR 101.3). Adding a word or two in front of the name of a standardized dairy food does

not represent an appropriate common or usual name of the food. It only adds confusion for consumers about the nutritional content of foods.

The plant-based gels produced and marketed by Kite Hill are imitations of real dairy yogurt, and should be labeled with a fanciful name that does not include the name of a standardized dairy product on the front of the package, or labeled as an imitation product (i.e. "Almond Imitation Yogurt") in accordance with 21 CFR 101.3(e).

NMPF has also noted other violations of federal labeling regulations on this product's packaging and on the manufacturer's website (www.kite-hill.com) and want to bring this to the attention of the California Department of Food and Agriculture. NMPF urges CDFA to take immediate and decisive action against this inappropriately named "Artisan Almond Milk Yogurt" with respect to applicable food labelling regulations, specifically as they relate to the purloined use of an established statement of identity.

Please feel free to contact us with any questions or for additional information. NMPF looks forward to your response.

Respectfully,

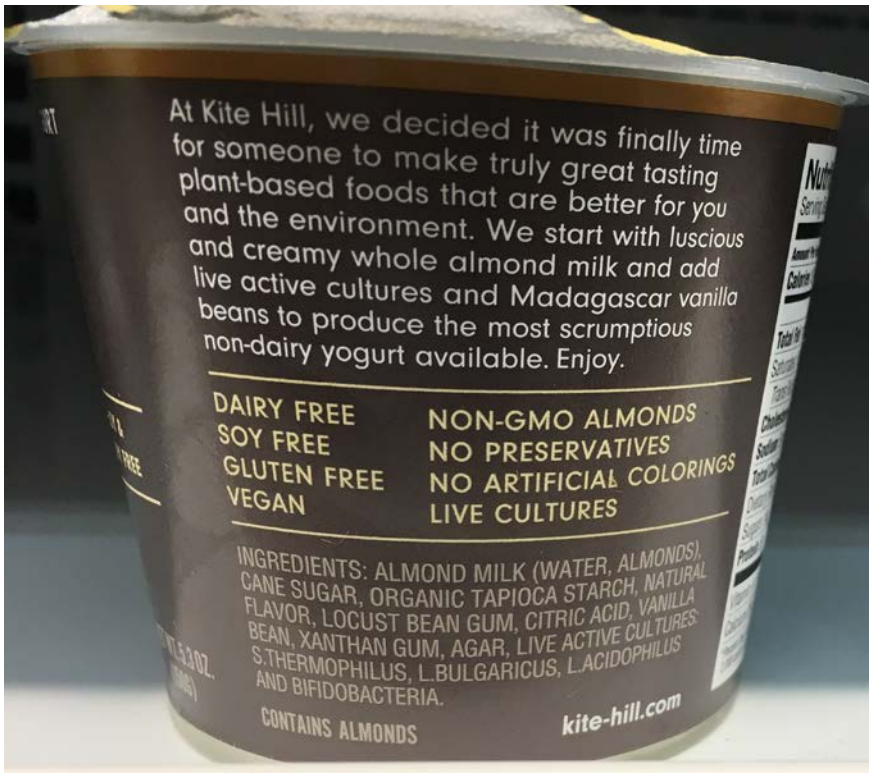
Beth Panko Briczinski

Beth Panko Briczinski, Ph.D.
Vice President, Dairy Foods & Nutrition

Enclosures

The National Milk Producers Federation, established in 1916 and based in Arlington, VA, develops and carries out policies that advance the well-being of dairy producers and the cooperatives they own. The members of NMPF's cooperatives produce the majority of the U.S. milk supply, making NMPF the voice of dairy producers on Capitol Hill and with government agencies. NMPF provides a forum through which dairy farmers and their cooperatives formulate policy on national issues that affect milk production and marketing.

Attachment: Photos of Kite Hill “Artisan Almond Milk Yogurt” Vanilla (product photographed on August 1, 2017).


At Kite Hill, we decided it was finally time for someone to make truly great tasting plant-based foods that are better for you and the environment. We start with luscious and creamy whole almond milk and add live active cultures and Madagascar vanilla beans to produce the most scrumptious non-dairy yogurt available. Enjoy.
DAIRY FREE
SOY FREE
GLUTEN FREE
VEGAN
NON-GMO ALMONDS
NO PRESERVATIVES
NO ARTIFICIAL COLORINGS
LIVE CULTURES
INGREDIENTS: ALMOND MILK (WATER, ALMONDS), CANE SUGAR, ORGANIC TAPIOCA STARCH, NATURAL FLAVOR, LOCUST BEAN GUM, CITRIC ACID, VANILLA BEAN, XANTHAN GUM, AGAR, LIVE ACTIVE CULTURES: S.THERMOPHILUS, L.BULGARICUS, L.ACIDOPHILUS AND BIFIDOBACTERIA.
CONTAINS ALMONDS
kite-hill.com


Nutrition Facts
Serving Size 1 Container
Amount Per Serving
Calories 180 Calories from Fat 100
% Daily Value*
Total Fat 11g 17%
Saturated Fat 1.5g 7%
Trans Fat 0g
Cholesterol 0mg 0%
Sodium 5mg 1%
Total Carbohydrate 15g 5%
Dietary Fiber 0g 0%
Sugars 14g
Protein 5g
Vitamin A 4% • Vitamin C 0%
Calcium 0% • Iron 0%
*Percent Daily Values (DV) are based on a 2,000 calorie diet.
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& Recycle
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TRADITIONALLY
CULTURED


ARTISAN ALMOND MILK YOGURT
kite hill
TRADITIONALLY CULTURED
SOY & DAIRY FREE
VANILLA
5x THE PROTEIN OF COCONUT YOGURT*
*CONTAINS 5G PROTEIN PER 5.3 OZ SERVING COMPARED TO 1G PROTEIN IN THE LEADING COCONUT YOGURT

EXHIBIT F

Project Title: Consumer Accuracy at Identifying Plant-based and Dairy-based Milk Items

Authors: Silke Feltz, University of Oklahoma
Adam Feltz, University of Oklahoma

Executive Summary:

On June 14, 2017, the European Parliament ruled that 'milk' terms could no longer be used to describe plant-based products. There are similar policy debates in the United States (e.g., the Dairy Pride Act). The motivation for the ruling and policies centers on two key claims: (1) using 'milk' terms to describe plant-based and animal-based products would cause confusion about which products are plant-based and animal-based, and (2) using 'milk' terms would cause confusion about the nutritional content of plant-based and animal-based products. We conducted 8 studies testing the extent to which people display the confusions indicated in 1 or 2. Overall, participants behaved as if confusions indicative of 1 and 2 are not pervasive.

We focused on confusion concerning milk and cheese products because of their ubiquity. We conducted a series of studies to determine if participants could accurately identify plant and animal-based cheese and milk products as plant or animal-based. A different series of studies was conducted to determine if people could accurately identify general nutritional differences between plant-based and animal-based milk and cheese products. Also, we aimed to develop an objective, knowledge-based measure of differences between plant-based and animal-based milk products. The measure was designed to help predict accuracy on the product and nutrition identification tasks. Finally, we replicated in a separate study all of the findings in a national sample.

Here, we report meta-analytically combined results. On average, participants were not measurably worse at identifying plant-based products than they were at identifying animal-based-products. Participants accurately identified the source of animal-based milk products 84% of the time, plant-based milk products 88% of the time, animal-based cheese products 81% of the time, and plant-based cheese products 74% of the time.

Participants accurately identified nutritional differences 62% of the time for milk products and 50% of the time for cheese products. The relatively low correct answer rate for nutritional differences should be interpreted as a lower bound estimate since participants who responded "I don't know" were not coded as answering the question correctly. “I don’t know” responses may accurately reflect an individual’s assessment of their knowledge and not an error. Treating “I don’t know” responses as correct increases milk nutrition accuracy to 73% and cheese nutrition accuracy to 75%.

The objective Milk Literacy Scale that we developed successfully predicted performance on the identification tasks (mean r = .2, 95% CI .08 - .32), suggesting those who knew more about differences between plant-based and animal-based products were better at the identification tasks. The national sample had a large enough sample size to construct path models estimating relations among variables. The path models suggested that those who are more numerate tend to be more milk literate and know more about general nutrition and about animals used as food. Milk literacy, general nutrition knowledge, and knowledge of animals used as food predicted performance on the nutrition identification tasks. Consistently, participants performed better on the subscale measuring differences between plant and animal-based milk products (M = 3.47 out of 6) than the subscale measuring differences among animal-based milk products (M = 1.89 out of 6).

These results suggest that generally, people are fairly accurate at identifying plant-based from animal-based products. To the extent that they are not, the path models suggest that some educational interventions would likely be successful in increasing consumer accuracy (via knowledge).

RUNNING HEADER: IDENTIFYING MILK ITEMS

Consumer Accuracy at Identifying Plant-based and Dairy-based Milk Items

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Abstract

Recent debates have centered on whether people are product literate enough to make informed decisions about plant-based and animal-based milk products. In 8 studies, we provide evidence that consumers do not make mistakes indicative of pervasive lack of product literacy. Overall, people were accurate at identifying plant-based and animal-based milk and cheese products as being plant or animal-based (74% - 84% of the time). Participants were also generally accurate at identifying nutritional differences between plant-based and animal-based milk and cheese products (50%-62% accuracy). We developed the Milk Literacy Scale, which is a 12-item, validated, knowledge-based instrument that measures knowledge of differences among plant-based and animal-based milk products. The Milk Literacy Scale predicted accuracy in the identification tasks (meta-analytically estimated $r = .2$). All results were replicated in a large, national sample ($N = 1054$). These results suggest that people are generally product literate about milk products and offer some insights into what kinds of interventions would help make people more product literate about milk.

Consumer Accuracy at Identifying Plant-based and Dairy-based Milk Items

On June 14, 2017, the European Parliament ruled that producers of plant-based milk items could no longer use the terms ‘cheese’ or ‘milk’ to describe their products. Those terms (along with the related terms like ‘whey’, ‘cream’, ‘butter’, ‘buttermilk’, and ‘yogurt’) are to be exclusively used for items that contain animal milk. Among the major reasons for this decision was the risk of confusion for consumers if terms traditionally used to designate animal-based milk (e.g., cheese, cream, whey) items were also used for plant-based milk items (e.g., soy milk, soy cheese). But do people make mistakes when identifying plant-based and dairy-based food items? Are people product literate enough to reliably distinguish plant-based milk products from dairy-based milk products?

We present 8 studies to help address these questions. Studies 1-3 present a short, efficient, 12-item measure of plant-based milk and animal-based milk knowledge. Studies 4-5 provide evidence that people are generally accurate at identifying plant-based from animal-based milk products, and this accuracy is predicted by increased knowledge of milk products and general nutrition knowledge. Studies 6-7 suggest that people are also able to accurately identify nutritional differences between plant-based and animal-based milk products. Again, accuracy was predicted by increased knowledge of milk products and general nutrition knowledge. Study 8 replicated the results from studies 1-7 on a larger, more nationally representative sample. Study 8 also allowed testing path models indicating that while knowledge of milk products and general nutrition knowledge were prominent predictors of accuracy, numeracy was also related to increased identification accuracy. These results suggest that generally people are product literate enough to identify key differences between plant-based and animal-based milk products and offer avenues for helping those who are not.

Consumer Product Literacy

Nearly all plant-based milk items are labeled as such (e.g., soy milk, vegan cheese). On the face of it, then, a conscientious consumer should have no trouble distinguishing plant-based and dairy-based milk items simply by reading the label. However, whether consumers use information on product labels is context sensitive and depends on individual motivations and backgrounds (for reviews, see Hall and Osses (2013), and Hess, Visschers, and Siegrist (2012)). By some estimates, nearly everyone uses product labels especially if the labels have the following features: graphs or symbols, adjective labels with minimal numerical information, and

information on the front of the package (Campos, Doxey, & Hammond, 2011).[1] Consequently, nutrition labels can contain "highly credible sources information, and many consumers report using nutrition labels to guide their selection of food products" (Campos et al., 2011, pp. 6-7).

One of the justifications for restricting the use of milk terms is that using terms like 'cheese' and 'milk' for plant-based products will lead to consumer confusion. Hence, even if people use labels in making decisions, those people will not generally be able to make accurate decisions about the milk products they buy. There are many examples of people not understanding information on product labels. For instance, while people generally understand the term 'calorie' they have difficulty linking calories to other concepts like energy and have trouble converting numerical information about calories meaningfully (Cowburn & Stockley, 2005). In this light, one could argue that using 'milk' terms in an environment that includes plant-based products would lead to misunderstandings like those seen with the term 'calorie.' People might in principle understand the difference between plant-based and animal-based milk products, but they would not be able to meaningfully translate that understanding into an accurate buying decision.

These examples call into question consumer *product literacy* about milk items. Product literacy can be defined as "the degree to which consumers have the capacity to locate, evaluate, apply, and communicate basic information needed to make appropriate product related decisions" (Kopp, 2012, p. 196). For some products, people do not have adequate product literacy (e.g., with calories). However, in other instances, people are very product literate. For example, people tend to be able to make simple comparisons and understand some vocabulary that is presented on labels (Cowburn & Stockley, 2005).

Given this background, our central question is: Are people product literate enough to accurately identify plant-based and dairy-based milk products? There are at least two different current arguments that have been offered for thinking that people generally are not product literate enough about milk products. The first argument is that people might be confused about which products are animal-based and which products are plant-based. For example, according to the European Court's ruling, "In the absence of such limits, those designations would not enable products with particular characteristics related to the natural composition of animal milk to be

[1] This same systematic review suggested that nearly 75% of Americans report using nutrition labels at least sometimes when they make a buying decision.

identified with certainty" (Case C-422/16, §44). Mistaking the nature of a product is the most basic kind of mistake that consumers could make. It stands to reason that if a person cannot accurately identify what a product is, then that person will also not be able to reliably identify other relevant properties of that item (e.g., nutritional content and differences with other products, environmental impacts).

A different argument holds that even if people are product literate enough to *identify* plant-based from animal-based products, they are not product literate enough to understand nutritional differences between plant-based and animal-based products. For example, according to the Dairy Pride Act (*Dairy Pride Act*, 2017), there is the risk that consumers would mistakenly assume nutritional equivalency between plant-based and animal-based 'milk' products. As the argument goes, the proper protection given such mistakes is to create or enforce legislation that bans using 'milk' terms for anything other than animal-based products.

To our knowledge, all of these claims about dairy confusion are not empirically tested. We set out to test them in 8 studies. The studies proceeded in three stages. The first stage was aimed to develop a research instrument to measure *Milk Literacy*. The Milk Literacy Scale (MLS) was designed to be an objective, general knowledge based instrument measuring what people know about differences between (a) animal-based and plant-based milk products and (b) different animal-based milk products (Studies 1-3). The second stage was designed to test whether people could accurately identify milk and cheese products as being animal or plant-based (Studies 4-5). The third stage was designed to test the degree to which people can accurately understand nutritional differences between dairy-based and plant-based milk items (Studies 6-7). Study 8 was designed to replicate findings of Studies 1-7 in a large, more nationally representative sample.

Milk Literacy Scale

We used Item Response Theory (IRT) to develop the MLS. IRT analyses measure latent traits. Latent traits are unobserved yet assumed to be causally responsible for a pattern of responses. In this case, the latent trait is knowledge of milk products. Unlike classical test theory, IRT can provide item-level analyses. In particular, IRT methods can estimate the probability that people of different levels of knowledge will answer a question correctly. If one plots the probabilities of correct answers among people with different levels of knowledge, the resulting plot forms an *S* curve (from low probability of correct answer for low-knowledge people to high

probability of correct answer for high-knowledge people). This *S* curve is called the *item characteristic curve*. Difficulty and discrimination are two important properties of item characteristics curves. An item's characteristics curve can be located on a scale of how difficult the item is. Items that have better discrimination will have sharper up-slopes on the *S* curve (i.e., the item does a better job discriminating among low and high ability at that ability location). Ideally for our purposes, the knowledge test should have items with strong discrimination and a variety of difficulties so that different ability levels can be estimated by the test. Study 1 was designed to identify those properties of desirable items. Study 1 was the first in a planned series of studies to find the set of items with desired properties.

Study 1

Study 1 was designed to test an initial battery of items to measure objective knowledge about milk products. The goal of Study 1 was to identify item-level properties of those knowledge based items. Using these analyses, we planned to identify empirically desirable items to retain for subsequent studies.

Participants

Two hundred and twenty-eight participants were recruited from Amazon's Mechanical Turk. Amazon's Mechanical Turk data are generally taken to have acceptable quality, especially in comparison to typical subject pools (e.g., university undergraduate subjects pools) (M. Buhrmester, Kwang, & Gosling, 2011; M. Buhrmester, Talifar, & Gosling, 2018; Crump, McDonnell, & Gureckis, 2013; Mason & Suri, 2012; Paollacci, Chandler, & Ipeirotis, 2010; Rouse, 2015). Demographics for the participants (for all studies) are reported in Table 1.

Materials

We developed 23 items that had face validity concerning aspects of soy milk and whole milk (see Appendix A). Twelve items dealt specifically with nutritional differences between whole cow milk and soy milk (e.g., whole cow milk has more cholesterol than fortified soy milk). These nutritional differences were based on an analysis by Vanga and Raghavan (2018). Call this the *Soy* subscale of the MLS. Ten items dealt specifically with differences between whole cow milk and skim cow milk (e.g., whole cow milk has more protein than skim cow milk). Call this the *Milk* subscale of the MLS. We also include one general question concerning whether soy milk is made with any cow milk (Item 23). Participants were asked to rate the statements as either being true or false. Finally, we collected basic demographic information.

Results and Discussion

Analyses proceeded on the assumption that each of the Soy and Milk subscales of the MLS measured only one latent variable (see subsequent studies for evidence for this assumption). So, two sets of IRT analyses were conducted on each set of items (item 23 was included in the Milk subscale). All IRT analyses were conducted using R (R Core Team, 2018) with the LTM package (Rizopoulos, 2006). A 2-parameter model was used for each set of items.[2] As expected, some items did not have desirable properties. Two Milk subscale items had negative discrimination (i.e., as one knows more, one is less likely to answer the item correctly). Four items of the Soy subscale items had reverse discrimination, and one item was exceedingly easy and had little discrimination (see Appendix A for details of each item).

Study 2

The results of Study 1 suggested several advantageous modifications to the MLS. First, the IRT analyses from Study 1 showed that some items had reverse discrimination (items 2, 6, 8, 13, 15, and 16). These items were eliminated for Study 2. Also, Item 1 had very low discrimination (0.17) and was very easy (-9.1), so Item 1 was also eliminated from subsequent studies. We also randomly selected items to change their true-values (i.e., taking the opposite truth-value) to ensure that the items behaved roughly the same with different truth-values. Finally, the discrimination was relatively low for many of the items. While we did not have direct evidence for this, we suspected that many people guessed at answers they did not know. This would likely result in getting some answers correct by chance and thereby reducing discrimination. To help alleviate this problem, we included an "I don't know" option in this and subsequent studies. The primary goal of Study 2 was to verify the item-level properties found in Study 1 using the revised MLS.

Participants

Two hundred and twenty-six participants were recruited from Amazon's Mechanical Turk.[3] Because we planned on a series of studies that drew on Amazon's Mechanical Turk's

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[2] A two-parameter model is different from a 1-parameter model. One-parameter models only estimate item difficulty and assume that the discrimination for each item is the same. Three-parameter models include a pseudo-guessing parameter in addition to estimating difficulty and discrimination that helps to control for people getting items correct simply by guessing (Baker, 2004).

[3] A coding mistake prevented demographic data from being collected in Study 2.

participants pool, we kept track of those who participated in previous studies. This was an effort to help ensure naiveté and non-repeated responses. No participants were allowed to take part in more than 1 study.

Materials

Participants received the modified MLS (see Appendix B).

Results and Discussion

Two separate IRT analyses using 2-parameter models were conducted, one for the Milk subscale and one for the Soy subscale of the MLS. The modified scale largely had acceptable discrimination along with a range of difficulties (see Table 2).

However, the results of Study 2 suggested that further refinements of the MLS were possible. First, two items in the Soy subscale had very low discrimination (Items 1 and 4, .23 and .29 respectively). Four items in the Milk subscale had similar difficulty (Items 10, 11, 13, and 15; 0.5, 0.61, 0.53, and 0.54 respectively). So, some of those four items could be eliminated without loss of information from the scale.

Study 3

Study 3 was designed to replicate the IRT results of Study 2 with the modifications suggested by Study 2. Study 3 was also designed to demonstrate that the MLS was multidimensional consisting of two unidimensional subscales Soy and Milk. Finally, since there was good reason to think that the 12-item Milk Literacy scale was going to have acceptable formally IRT properties, Study 3 afforded the opportunity to begin to display convergent and divergent validity. To help establish convergent validity, we included the Nutrition Knowledge Scale (Dickson-Spillmann, Siegrist, & Keller, 2011). If the MLS measures food knowledge, then the MLS score should be related to general nutrition knowledge. To help establish divergent validity, participants responded to a general personality inventory. If the MLS measures knowledge, then it should be largely unrelated to general personality traits.

Participants

Two-hundred and thirty participants were recruited from Amazon's Mechanical Turk.

Materials

The Milk Literacy Scale (MLS). A modified, 12-item version of the MLS was used. In particular, Items 1 and 4 were eliminated from the Soy subscale because they had very low discrimination. Because 4 items in the Milk subscale had similar properties, some of those items

could be eliminated without much loss of information. To that end, we eliminated Items 11 and 13 because they had the lowest discrimination of the 4 items. The Soy and Milk subscales of the MLS had 6-items each. Each statement was rated as being either true, false, or the participants could respond that they did not know. Correct answers were coded as '1' and incorrect or "I don't know" responses were coded as '0'. A total correct answer score for each of the two subscales was calculated.

The Nutrition Knowledge Scale (Dickson-Spillmann et al., 2011). The Nutrition Knowledge scale is a 20-item scale with general statements about nutrition (e.g., “Brown sugar is much healthier than white sugar). Response options were true, false, or "I don’t know." Correct answers were coded as '1' and incorrect or “I don’t know” responses were coded as '0'. A total correct answer score was calculated for the Nutrition Knowledge Scale.

The Ten-Item Personality Inventory (TIPI) (Gosling, Rentfrow, & Swann, 2003). The TIPI is a 10-item measure of the Big Five Personality traits. Each of the Big Five traits is measured by rating how much pairs of adjectives describe one’s self (e.g., “extraverted, enthusiastic”) on a 7- point Likert scale (Disagree strongly to Agree strongly). Scores for each of the Big Five are calculated by averaging ratings from two pairs of adjectives.

Results and Discussion

A test of unidimensionality was conducted on the entire 12-item MLS. The test for unidimensionality tested whether the eigenvalue for the second factor is greater than would be theoretically expected. If the second eigenvalue is greater than would be expected, then one can reject unidimensionality. The theoretical eigenvalue based on 200 Monte Carlo samples was 1. The eigenvalue of the second factor in the data was 2.4, significantly greater than the theoretically derived eigenvalue (p = .005). Unidimensionality could be rejected for the full MLS. Unidimensionality tests were done for each of the Milk and Soy subscales using the same method. In each case, unidimensionality could not be rejected: Soy observed second eigenvalue = .38, average eigenvalue of 200 Monte Carlo samples = .52, p = .89; Milk observed second eigenvalue = 0.82, average of second eigenvalue in 200 Monte Carlo samples = .78, p = .31.

A series of IRT analyses were conducted on each subscale of the MLS. The first set of analyses concerned the Soy subscale of the MLS. Planned analyses compared a constrained 1-parameter model to an unconstrained 1-parameter model. The unconstrained 1-parameter (AIC = 1543.26, BIC = 1567.39) model was a better fit to the data than the constrained model (AIC =

1559.08, BIC = 1579.76), $p < .001$. The unconstrained 1-parameter model had good fit to the data, passing a goodness of fit test, $p = .17$ and having acceptable residuals on the margins (all chi squared values < 1.31). A 2-parameter model (AIC = 1544.33, BIC 1585.69) was not significantly better than the 1-parameter unconstrained model, $p = .11$. However, the 2-parameter model also had acceptable fit to the data with all chi square values of residuals on the margins less than .76.

We performed the same series of analysis on the Milk subscale of the MLS. A 1-parameter unconstrained model (AIC = 1463.17, BIC = 1487.3) was a better fit to the data than a 1-parameter constrained model (AIC = 1466.87, BIC = 1487.55), $p = .02$. A 2-parameter (AIC = 1434.11, BIC 1475.47) model was a better fit to the data than a 1-parameter unconstrained model, $p < .001$. The 2-parameter model also had acceptable residuals on the margins for the items, all chi squared values < 1.24.

The IRT analysis suggested that the 12-item version of the MLS had acceptable internal properties. Convergent, divergent, and criterion validity remained to be demonstrated. While we planned to establish criterion validity in subsequent studies, some evidence for convergent and divergent validity could be provided in the current study. Correlations were calculated between the variables gathered (see Table 3). As expected, both of the MLS subscales were moderately to strongly related to the Nutrition Knowledge Scale, suggesting convergent validity. The Soy subscale of the MLS was also moderately related to the global personality trait conscientiousness. This somewhat unexpected finding makes sense in the context that conscientious people are likely to be more engaged and vigilant about what they eat (Lunn, Nowson, Worsley, & Torres, 2014). The Soy and Milk subscales were weakly related to other personality traits suggesting divergent validity.

Of note, the Milk subscale of the MLS ($M = 1.95$, $SD = 1.5$) was more difficult than the Soy subscale ($M = 4$, $SD = 1.7$), $t(231) = 15.7$, p , .001, $d = 1.03$. This result suggests that people are less knowledgeable about the differences among animal-based 'milk' products then they are about differences between animal-based and plant-based milk products, at least as measured by the MLS.

Production Identification

One of the main arguments for forbidding the use of 'milk' terms for plant-based products is that the usage would cause confusion among consumers. Studies 4 and 5 were designed to

determine how good people are at correctly identifying animal based and plant-based milk products. Two types of milk products were selected because of their general ubiquity and availability. The first set of items (Study 4) was milk items (e.g., soy milk and whole milk). The second set of items (Study 5) was cheese items.

Study 4

Participants

One hundred and twenty-five participants were recruited from Amazon's Mechanical Turk.

Materials

The materials were a set of images from commercially available milk products. We selected 4 images of animal-based milk products and 4 images of plant-based milk products. There was one between-subjects condition. In one condition, participants received 4 animal-based and 2 plant-based images. In the other condition, participants received 2 animal-based and 4 plant-based images. The plant-based images included almond milk, coconut milk, rice milk, and soy milk. The animal-based images included 1% milk, 2% milk, skim milk, and whole milk. An example image for each animal-based and plant-based products is included in Appendix C (all images are available from the authors upon request). All six images were presented at once on the screen. Participants were instructed to select the items that were made with real cow's milk by clicking on the image. After completing the product identification task, participants completed the MLS and basic demographic information was gathered.

Results and Discussion

The different number of images did not reliably influence accuracy of plant-based images F (1, 124) = 0.8, p = .78, $\eta^2 < .001$ or animal-based images F (1, 124) = 1.82, p = .18, η^2 = .02. Because there was no reliable difference with respect to the number of images used, we did not include the number of images as a factor in subsequent analyses. Correct scores for the product identification task were combined for each of the plant-based and animal-based products for analyses.

We analyzed whether participants were reliably different from chance at identifying products (chance = 0.5). Participants were substantially better than chance at identifying animal-based products (77%, t(1,124) = 8.83, $p < .001$, d = 0.79) and plant-based products (94%, t(1, 124) = 30.74, $p < .001$, d = 2.75.

Participants were reliably better at identifying plant-based based items compared to animal-based items, $t(1, 124) = 6.76$, $p < .001$, $d = .61$. Participants were also reliably better on the Soy subscale of the MLS ($M = 3.54$, $SD = 1.73$) than they were on the Milk subscale of the MLS ($M = 2.05$, $SD = 1.33$), $t(125) = 8.32$, $p < .001$, $d = 0.74$.

The correlations among the variables are reported in Table 4. The Soy subscale of the MLS was a significant predictor of product identification accuracy, suggesting criterion validity for the Soy subscale.

Study 5

Participants

One hundred and twenty-five participants were recruited from Amazon's Mechanical Turk.

Materials

The procedure used in Study 4 was used in Study 5. Participants were presented with either 4 or 2 animal-based cheese items along with 2 or 4 plant-based cheese items at one time on a screen. The plant-based images included vegan cheddar cheese, vegan cream cheese, vegan nacho sauce, and vegan cheese slices. The animal-based images included cheddar cheese, cheese dip, cream cheese, and swiss cheese. An example item is included in Appendix C (all images available upon request). Participants were asked to identify which of the 6 images were made from "real cow's milk" by clicking on the image of the product. After completing the product identification task, participants answered the 12-item MLS and basic demographic information was collected.

Results and Discussion

The number of images did not reliably influence accuracy for animal-based items (t (1, 123) = .01, $p = .99$, $d = .002$) or plant-based (t (1, 123) = 0.53, $p = .6$, $d = 0.1$) products. Number of images was therefore excluded as a factor in subsequent analyses. A total correct answer score was calculated for each of the plant-based and animal-based products.

Participants were reliably better than chance (= 0.5) at identifying plant-based cheese items (90% accurate, t (1, 124) = 22.87, $p < .001$, $d = 2.05$) and animal-based cheese items (64% accurate, $t(1, 124) = 5.43$, $p < .001$, $d = .49$). Participants were reliably better at identifying plant-based compared to animal-based cheese items, t (1, 124) = 8.08, $p < .001$, $d = 0.72$. Participants

were also better on the Soy subscale of the MLS (M = 2.95, SD = 1.33) than they were on the Milk subscales of the MLS (M = 1.82, SD = 1.36), $t(125) = 6.89$, $p < .001$, $d = 0.62$.

Correlations were calculated (see Table 4). In this case, there were no reliable predictors of performance on the cheese product identification task.

Nutrition Identification

A separate concern about consumer product literacy is whether using 'milk' terms for both animal and plant-based products causes nutritional confusion. Studies 6 and 7 were designed to test the extent to which people are confused about the nutritional content of plant-based and animal-based milk items. If using 'milk' terms for both kinds of items causes confusion, then there should be substantial errors when people compare the nutritional content of plant-based and animal-based milk products.

Study 6

Study 6 was designed to see how well participants could identify simple nutritional information comparing animal-based to plant-based milk items.

Participants

One hundred and twenty-five participants were recruited from Amazon's Mechanical Turk.

Materials

We selected two paradigmatic images representing plant-based and animal-based milk: almond milk and whole cow Milk (see Appendix C for images). These images were selected because they clearly display what kind of product they are to help minimize the chances product confusion. We then selected several nutrition questions that were easily identified on the label of the product. We did not present nutritional labels to participants because we were interested in native nutritional knowledge of the products. The nutritional questions and instructions were (correct answers in parentheses):

> Please answer the following questions about these two products. PLEASE DO NOT LOOK UP ANSWERS ONLINE. If you do not know the answer, please respond that you do not know.

1. Which product has more calories? (Milk)
2. Which product has more fat? (Milk)
3. Which product has more cholesterol? (Milk)

4. *Which product has more sodium? (Almond)*
5. *Which product has more protein? (Milk)*
6. Which product has more fiber? (Almond)
7. Which product has more sugars? (Milk)

We also used three environmental impact questions. These questions were used to estimate the extent to which people know about the relative contribution to environmental problems of each product. While these are not explicitly about nutrition, they are related to general health concerns that people might have (see for more information, see Ho, Maradiaga, Martin, Nguyen, and Trinh (2016)).

8. *Which product uses more water? (Almond)*
9. Which product generates more waste? (Milk)
10. Which product has a larger carbon footprint? (Milk).

For each question, participants were allowed to select one of the two images and were also allowed to select that they did not know. Correct answers were coded as 1. Incorrect answers and "I don't know" responses were coded as 0.

Participants then completed the MLS, the General Nutrition Scale used in Study 3, and basic demographic information was gathered. The General Nutrition scale was used in this experiment because participants were asked specifically about the nutritional content of plant-based and animal-based milk products. To further help establish validity of the MLS, we intended to estimate whether the MLS predicted accuracy on the Nutrition Identification task beyond knowledge estimated by the General Nutrition Scale.

Results and Discussion

IRT analysis indicated that 3 items had reverse discrimination (Items 4, 5, and 8). Those items were eliminated from analysis. Another IRT analysis was conducted on the remaining 7 items. All items had acceptable discrimination (> 0.43) and a range of difficulties (-1.74 to 0.1). A 2-parameter model had an acceptable fit to the data (all residuals on the margin had chi-squared < 3.5). So, a composite score of the 7-items were calculated. The resulting scale was roughly normal (M = 4.47, SD = 1.76, *skewness* = -.51, *kurtosis* = -0.24). On average, participants could answer 64% the questions correctly. Item-level correct answers were: Calories 71%, Fat 85%, Cholesterol 70%, Fiber 67%, Sugars 48%, Waste 64%, and Carbon Footprint 61%. Additionally, participants were reliably better at Soy subscale of the MLS (M = 3.3, SD =

1.84) than they were at the Milk subscale of the MLS (M = 1.94, SD = 1.47), $t(125) = 7.52$, $p < .001$, $d = .67$.

We were also interested in predicting performance on the Milk Nutrition Identification task. To do so, we calculated correlations among the variables (see Tale 5). Again, the Soy subscale of the MLS was a reliable predictor of correct responses to the Nutrition Identification Task suggesting criterion validity. To determine the unique predictive ability of the Soy subscale of the MLS, we used a stepwise multiple regression with the total score on the Nutrition Identification Task as the outcome variable and MLS Soy, MLS Dairy, Nutrition Knowledge, Sex, Age, and Politics as predictor variables (see table 6). The Soy subscale of the MLS was the strongest predictor of correct responses to the Nutrition Identification Task.

Study 7

Study 7 was designed to estimate how well people could identify nutritional information about plant-based and dairy-based cheese items.

Participants

One hundred and thirty-four participants were recruited from Amazon's Mechanical Turk.

Materials

The same general approach that was used in Study 6 was used in Study 7 except that cheese images were used instead of milk images. We selected two paradigmatic images that represent animal-based and plant-based cheese items. One image depicted a Daiya plant-based cheese product and the other image depicted an animal-based cheese product (See appendix C). Participants answered the following questions about each pair of images:

> Please answer the following questions about these two products. PLEASE DO NOT LOOK UP ANSWERS ONLINE. If you do not know the answer, please respond that you do not know.

1. *Which product has more calories per slice?* (Daiya)
2. *Which product has more fat per slice?* (Daiya)
3. Which product has more cholesterol per slice? (Milk)
4. Which product has more sodium per slice? (Milk)
5. Which product has more protein per slice? (Milk)
6. Which product has more calcium per slice? (Milk)

7. Which product has more sugars per slice? (Milk)
8. Which product uses more water per slice? (Milk)
9. Which product generates more waste per slice? (Milk)
10. Which product has a larger carbon footprint per slice? (Milk).

Participants could select one of the two images or indicate that they did not know. Participants also complete the MLS, the Nutrition Knowledge scale, and basic demographic information was gathered.

Results and Discussion

The IRT analysis showed that two of the Cheese Nutrition Identification items had reverse discrimination (Items 1 and 2). Those items were eliminated from analyses. After excluding those items, a 2-parameter IRT model was an acceptable fit to the data (all residuals on the margins had chi-squared < 3.5). A total score for the remaining 8 items was calculated and used in analysis. On average, participants knew the correct answer for 55% of the statements (M = 4.42, SD = 2.09). Item level descriptive statistics were: Cholesterol 62%, Sodium, 49%, Protein 49%, Calcium 50%, Sugars 50%, Water 43%, Waste 64%, Carbon Footprint 60%. In addition, participants were reliably better at the Soy subscale of the MLS ($M = 3.37$, $SD = 1.78$) than they were at the Milk subscale of the MLS ($M = 1.74$, $SD = 2.05$), $t(134) = 6.92$, $p < .001$, $d = 0.6$.

Correlations among the variables are reported in Table 4. The Soy subscale of the MLS was a reliable predictor of performance on the Cheese Nutrition Identification task, suggesting criterion validity. We also performed a stepwise regressions using performance on the Cheese Nutrition Identification task as the outcome variable and using the MLS Soy, MLS Dairy, Nutrition Knowledge, Sex, Age, and Politics as predictor variables. The only significant predictor of performance on the Cheese Nutrition Identification task was the Soy subscale of the MLS, so we do not include the regression analysis here.

National Sample

The final in the planned series of studies was to replicate the findings of Studies 1-7 in a more nationally representative sample drawn from a different sampling service. MTurk data is generally reliable for many tasks, but there are some known issues with data collected from MTurk including non-naiveté and inattentiveness (M. Buhrmester et al., 2011; M. D. Buhrmester, Talaifar, & Gosling, 2018; Chandler, Mueller, & Paolacci, 2014; Thomas &

Clifford, 2017). To help alleviate worries associated with biases in MTurk samples, we collected a sample using Qualtrics (see Qualtrics.com for more information).

Study 8

Participants

One thousand one hundred and eighty participants were recruited from Qualtrics testing service. For analyses, 126 participants were excluded for straight-lining responses (see below) leaving 1054 participants.

Materials

We used all of the finalized instruments from Studies 1-7 with some slight modifications. For the product identification tasks, we used 8 milk images (4 plant-based and 4 animal-based) and 8 cheese images (4 plant-based and 4 animal-based). Participants were given each set of images on 2 separate screens and the images were presented in random order. The participants were given the following instructions: “Please drag the items made with cow’s milk into the ‘milk’ box and the items not made with cow’s milk into the ‘non-milk’ box.” There were two boxes on screen labeled "cow's milk" or "non-cows' milk." Participants were required to drag the images to one of the two boxes. Number of correct responses was calculated for each of cow's milk and non-cow's milk. Participants completed the modified Nutrition Identification Task from studies 6 and 7 (i.e., eliminating the items that had reverse discrimination). The 4 identification tasks were counterbalanced for order.

Participants were given the final version of the MLS, the Nutrition Knowledge, BNT, and the TIPI. Participants were also given the Knowledge of Animals as Food scale (KAFS) (Feltz & Feltz, submitted). The KAFS is a 9-item measure of how much people know about animals used as food. The KAFS has been shown to be related to general food decisions and related to a reduction in consuming animal products. Consequently, it was hypothesized that the KAFS would predict accuracy in the product identification. BNT was included as a general measure of numeracy (Cokely, Galesic, Schulz, Ghazal, & Garcia-Retamero, 2012). Numeracy has been related to normatively correct decisions in a host of domains (Ghazal, Cokely, & Garcia-Retamero, 2014; Petrova et al., 2017). We hypothesized that the BNT would be positively related to correct responses in the identification tasks. Finally, basic demographic information was gathered.

Results and Discussion

A visual inspection of the descriptive statistics revealed some problematic aspects of the data. In particular, there were a large number of zeros for the total score for the Nutrition Knowledge Scale. Otherwise, the distribution of results for the Nutrition Knowledge Scale was normal. This pattern of results was unlike the results obtained in the instrument's original validation and unlike the pattern of results observed in previous studies we conducted. Further investigation of this deviant pattern revealed a number of "straight-lined" responses—many participants answered "Don't know" to all of the nutrition questions, even questions that were very easy based on previous research. Those who straight-lined responses to the Nutrition Knowledge Scale also appeared to straight-line responses on other instruments. This suggests that some participants were not attentive or rushed through the survey. Consequently, following established practice after identifying straight-lined response (Leiner, 2016), we eliminated those who answered every question of the Nutrition Knowledge Scale "I don't know" (N = 126).[4]

The ***MLS Scale***

A test of unidimensionality on the full MLS suggested that unidimensionality could be rejected: observed second eigenvalue = 1.97, average second eigenvalue in 200 Monte Carlo samples = 0.58, p = .005. Tests for unidimensionality were conducted on each of the MLS subscales: Soy observed second eigenvalue = .55, average eigenvalue of 200 Monte Carlo samples = .30, p = 0.005; Milk observed second eigenvalue = 0.68, average of second eigenvalue in 200 Monte Carlo samples = .57, p = .03. While the test for unidimensionality was significant for the two subscales, the second eigenvalues were substantially less the second eigenvalue observed for the full scale. Plus, with the increased power of the study, conventionally significant results are likely to be detected even if the second eigenvalues were small. So, we proceeded by assuming that the MLS consisted of two unidimensional subscales.

We first performed IRT analyses on the Soy subscale of the MLS. A one-parameter unconstrained model (AIC = 7656.49, BIC 7691.21) was a better fit to the data that a one-parameter constrained model (AIC = 7660.99, BIC 7690.75), p = .01. A 2-parameter model (AIC 7647.52, BIC = 7707.06) was a better fir to the data than a 1-parameter unconstrained model, p = .002 (item difficulty and discrimination are provided in Table 2). The 2-parameter model had

[4] We conducted analyses without excluding participants who straight-lined. As expected, including those participants did not change the results drastically, but they did mute effects making some of the effects more difficult to detect. This pattern is exactly what would be expected given straight-lined responses.

largely good fit to the data—the chi squared values for the residuals of the margins were largely in the acceptable range (< 3.5). Two items were involved with chi-squared values larger than 3.5—items 5 and 3 (= 4.36) suggesting that in this study, the model did not fit those items particularly well.

The same analyses were conducted on the Milk subscale of the MLS. A one-parameter unconstrained model (AIC = 6755.58, BIC 6790.3) was a better fit to the data that a one-parameter constrained model (AIC = 6777.58, BIC 6807.34), p < .001. A 2-parameter model (AIC 6639.88, BIC = 6699.4) than a 1-parameter unconstrained model, $p < .001$ (item difficulty and discrimination are provided in Table 2). The 2-parameter model had largely good fit to the data—the chi-squared values for the residuals of the margins were largely in the acceptable range (< 3.5). One item was involved in residuals greater than 2.5 (item 10). ICCs and the TIF are presented in Figures 3 and 4.

As observed in previous studies, participants performed better on the Soy subscale (M = 3.62, SD = 1.61) than the Milk subscale ($M = 1.69$, $SD = 1.52$), t (1, 1053) = 32.59, $p < .001$, d = 1.

Product Identification Tasks

The identification tasks were counterbalanced for order (i.e., each task occurred in only 1 of the 1, 2, 3, of 4th spot). The first step in the analysis was to test for orders effects. Each of the product identification tasks was entered as the dependent variable and the order of presentation was used as the independent variable. There were no order effects for the two milk product identification tasks: Plant-based milk $F(1, 1050) = 2.02$, $p = .1$, $\eta^2 = .006$, Animal-based milk $F(1, 1050) = 1.86$, $p = .17$, $\eta^2 = .005$. There were statistically significant order effects for the two cheese product identification tasks: plant-based cheese $F(1, 1050) = 2.86$, $p = .04$, $\eta^2 = .008$, animal-based cheese $F(1, 1050)) = 4.47$, $p = .004$, $\eta^2 = .01$. Even though responses to the two cheese based product identification tasks displayed a statistically significant order effect, the magnitude of the effect was small. So, because of the small effect sizes and for simplicity of analyses, we did not include order as a factor in subsequent analyses.

Participants were better than chance (= 2) at identifying all products: Animal-based milk ($M = 3.65$, $SD = 0.64$ $t(1, 1053) = 83.38$, $p < .001$, $d = 2.57$; Plant-based milk ($M = 3.24$, SD = 1.25) $t(1, 1053) = 32.36$, $p < .001$, $d = 0.99$; plant-based cheese ($M = 2.82$, $SD = 1.08$) $t(1, 1053)$ = 24.55, $p < .001$, $d = 0.76$; and animal-based cheese ($M = 3.31$, $SD = 0.85$) $t(1, 1053) = 49.78$, p

< .001, d = 1.53. In this study, participants were better at identifying animal-based milk products $t(1, 1053) = 9.85$, $p < .001$, $d = 0.3$ and animal based cheese products $t(1, 1053) = 12$, $p < .001$, $d = 0.37$.

Finally, we calculated correlations among the variables gathered. Correlations are reported in Table 7.

Nutrition Identification

No order effect was found for either the milk nutrition identification task ($F(3, 1050) = 0.83$, $p = .48$, $\eta^2 = .002$) or cheese Nutrition Identification Task ($F(3, 1050) = 0.05$, $p = .99$, $\eta^2 = 0$). People were generally better at identifying milk nutrition items ($M = 4.29$, $SD = 1.9$, 61% correct) compared to cheese nutrition items ($M = 3.61$, $SD = 2.21$, 45% correct), $t(1053) = 19.29$. $p < .001$, $d = .59$.

Item level statistics were calculated for each question. For the milk nutrition items, the following were the percent of correct responses: Calories 69%, Fat 22%, Cholesterol 40%, Fiber 64%, Sugars 44%, Waste 47%, and Carbon Footprint 47%. For the cheese questions, the following percent responded correctly: Cholesterol 62%, Sodium, 51%, Protein 37%, Calcium 46%, Sugars 44%, Water 30%, Waste 46%, Carbon Footprint 43%.

Correlations among the dependent variables are reported in Table 7.

Path Analyses

We used path analyses to estimate relations among key variables measured. The primary outcome variable of interest was the performance on the identification tasks. We randomly divided the data into 2 groups: a test set and a validation set. We formulated path models based on the correlations observed in the studies and then tested and refined the models on the test set. The modified path models were then tested again on the validation set. Path models for the test and validation sets for the product identification Tasks are in Figures 5 and 6. Path models for the nutrition identification tasks are in Figure 7. All but one of the models passed conventional fit criteria. The models had the following test statistics.

Animal-Based Milk Product Identification: The test set model passed all conventional fit criteria: $\chi^2(2) = 1.31$, $p = .52$, *RMSEA* = 0, *90% CI* = 0-.08, *pclose* = .81, *CFI* = 1, *TLI* = 1. The validation set model also passed all conventional fit criteria: $\chi^2(2) = 0.74$, $p = .69$, *RMSEA* = 0, *90% CI* = 0-0.6, *pclose* = .9, *CFI* = 1, *TLI* = 1. All indirect paths were significant ($p < .05$).

Plant-based Milk Product Identification: The test set model passed all conventional fit criteria: χ^2 (2) = 2.35, p = .31, *RMSEA* = .02, 90% CI 0-0.9, *pclose* = .66, *CFI* = 1, *TLI* = .99. The validation set model also passed all conventional fit criteria: χ^2 (2) = 0.76, p = .69, *RMSEA* = 0, 90% CI 0-0.6, *pclose* = .9, *CFI* = 1, *TLI* = 1. All indirect paths were significant (p < .05).

Animal-based Cheese Product Identification: The test set model passed all conventional fit criteria: χ^2 (2) = 0.71, *p* = .7, *RMSEA* = 0, *90% CI* = 0-.07, *pclose* = .9, *CFI* = 1, *TLI* = 1. The validation set model also passed all conventional fit criteria: χ^2 (2) = 1.11, *p* = .57, *RMSEA* = 0, *90% CI* = 0-.07, *pclose* = .85, *CFI* = 1, *TLI* = 1. All indirect paths were significant (*p* < .05).

Plant-based Cheese Product Identification: The test set model passed all conventional fit criteria: χ^2 (2) = 0.65, *p* = .72, *RMSEA* = 0, *90% CI* = 0-0.6, *pclose* = .91, *CFI* = 1, *TLI* = 1. The validation set model also passed all conventional fit criteria: χ^2 (2) = 0.75, *p* = .69, *RMSEA* = 0, *90% CI* = 0-.06, *pclose* = .9, *CFI* = 1, *TLI* = 1. All indirect paths were significant (*p* < .05).

Milk Nutrition Identification: The test set model passed all conventional fit criteria: χ^2 (2) = 0.8, *p* = .67, *RMSEA* = 0, *90% CI* = 0-.07, *pclose* = .88, *CFI* = 1, *TLI* = 1. The validation set model also passed all conventional fit criteria: χ^2 (2) = 1.49, *p* = .48, *RMSEA* = 0, *90% CI* = 0-.08, *pclose* = .8, *CFI* = 1, *TLI* = 1. All indirect paths were significant (*p* < .05).

Cheese Nutrition Identification: The test set model passed all conventional fit criteria: χ^2 (2) = 4.93, *p* = .08, *RMSEA* = .05, *90% CI* = 0-.12, *pclose* = .36, *CFI* = .99, *TLI* = .95. The validation set model, however, did not pass all conventional fit criteria: χ^2 (2) = 10.44, *p* = .005, *RMSEA* = .09, *90% CI* = .04-.14, *pclose* = .09, *CFI* = .97, *TLI* = .84. All indirect paths were significant (*p* < .05) except for the BNT→ Cheese Nutrition indirect path, *p* = .06.

General Discussion

The results of the eight studies suggested that people are often product literate enough to reliably distinguish plant-based products from animal-based products. People also generally understand nutritional differences among plant-based and animal-based products.

To help further illustrate people's general product literacy, there were some differences among the studies. Studies 4 and 5 suggested that people are generally better at identifying plant-based milk products and study 8 suggested that they were better at identifying animal-based milk products. To help address the conflicting results, we meta-analytically combined the percentage of correct responses and tested for differences using plant-based v. animal-based products as a

moderator. Concerning milk products, there was no significant moderator effect between animal-based (84%) and plant-based (88%) accuracy, $z = 0.37$, $p = .71$. A similar pattern was found for cheese product identification accuracy. People we no better at identifying animal-based (81%) cheese products compared to plant-based (74%) cheese products, $z = 0.52$, $p = .6$.

The evidence suggests that participants in general have the ability to identify plant-based and animal-based 'milk' products. As the meta-analytic estimates suggest, people identify products correctly between 74% and 88% of the time. While this is not 100% accuracy, it is unreasonable to expect 100% accuracy. There are many reasons why one would make a mistake including simple performance errors (clicking on the wrong item) and inattentiveness. These sources of error do not reflect a deep, systematic ignorance. If an element of product literacy is that consumers are able to understand and articulate differences among products, then it appears that people are generally product literate enough to at least distinguish plant-based from animal-based milk products.

Concerning nutritional differences, participants' accuracy was worse than their performance on product identification. To illustrate, we again meta-analytically combined the nutrition accuracy for Studies 5, 6, and 8. We used the mean correct scores for each of the tasks and used them as a moderator whether the nutrition was being identified for cheese or milk products. There as no overall moderator effect between the cheese and milk tasks, $z = 0.96$, $p = .34$. Overall mean correct score for milk was 4.37 (62%), *95% CI* = 3.81 - 4.94 and for cheese was 3.98 (50%), *95% CI* = 3.42 - 4.55.Hence, people tended to be roughly as good at identifying nutritional differences among milk and cheese items.

One might think that the overall scores for the nutrition identification tasks supports the argument that using 'milk' terms for plant and animal-based products causes nutritional confusion. But such support should be tempered for at least 3 reasons. First, the way that we coded responses to the nutritional task was that only correct answers were scored as correct and all other answers were scored as being incorrect. We adopted this scoring strategy partially to follow previous research (e.g., Cowburn and Stockley (2005)) and partially to provide the strongest test of consumer product literacy (i.e., only counting as correct those who knew the correct response). However, one could argue that if one knows that one does not know, then that does not indicate confusion. Rather, that reflects that one honestly does not know and not that one believes something that is false. So, people may not be making a mistake when they respond

that they do not know. If we include those who responded that they do not know as being correct, then the percentage of correct responses increases dramatically. In Study 6, 86 of 1000 (~8.6%) response were "I don't know." Similarly for Study 7, the total number of "I don't know" response was 291 of 1072 (~20%). If we included those "incorrect" responses in the "correct" response category, then people correctly responded to 72.6% of the milk nutrition questions and 75% of the cheese nutrition questions. Consequently, the results for the nutrition identification tasks should be taken as a lower bound of accuracy.

Second, participants were more knowledgeable about differences between plant-based and animal-based products than they were about differences between animal-based products (i.e., whole milk v. skim milk) as measured by the MLS. We meta-analytically combined the results the MLS from studies 3-8 and found that on average, people were more knowledgeable on the Soy subscale (M = 3.47, SE = 0.15, *95% CI* = 3.18 - 3.76) than they were for the Milk subscale (M = 1.89, SE = 0.07, *95% CI* = 1.76 - 2.02), d = 0.79 (SE = 0.08) z = 9.67, $p < .001$, *95% CI* = 0.62 - 0.95. This result is consistent with the general ignorance about the nutritional differences among animal-based milk products (Finnell & John, 2017). The results from the meta-analysis of the MLS and previous research weaken the claim that there is widespread confusion about the nutritional difference between plant-based and animal-based milk products. Or, by parity of reasoning, one should be concerned about the nutritional ignorance surrounding animal-based milk products. According to our studies, people knew about ¾ of a standard deviation more about plant-based compared to milk-based products. If this is right, then, if anything, having plant-based products labeled as milk will make people *more* knowledgeable about nutritional differences among milk products.

Third, our data indicate that people are not perfectly knowledgably about milk products. But that leaves open what the best interventions are for those who need help. The structural models provide some important clues about how to help people make better consumer decisions. In the broadest terms, those who knew more about milk and nutrition were better at the identification tasks. That means that there are some fairly clear interventions that would likely help people become more product literate. For example, the links between animal welfare knowledge, general nutrition knowledge, and milk specific knowledge suggest that simply educating people about the facts of milk would help people make better, more informed decisions about milk products. Indeed, given the evidence presented here, simply forbidding the

use of some language will not rectify issues of knowledge concerning milk products since many people are ignorant about some facts concerning animal-based milk.

Additionally, the links with numeracy suggest that providing some simple visual aids (e.g., on packages or in supermarkets) could help people make better, more informed decisions. Those who are more numerate tend to make more normative correct choices in general (Cokely, Garcia-Retamero, Ghazal, Allan, & Feltz, in press). In this instance, those who were more numerate did a better job on the product and nutrition identification tasks but also tended to be more knowledgeable in general (e.g., the MLS, KAFS, Nutrition Knowledge). In related research, providing simple visual aides have been shown to help those who are less numerate make choices that are more like those who are highly numerate (Garcia-Retamero, Petrove, Feltz, & Cokely, in press). So, there are likely to be some simple visual aides that would help people to make more correct choices.

There are a number of limitations with the current series of studies. First, the choices concerning product identification were somewhat artificial. Participants were shown images of products and asked to make decisions about them. In real environments like grocery stores, a different pattern of results may have been observed. Moreover, there could be some other, even more subtle confusions that using 'milk' terms for both animal-based and plant-based products could cause (e.g., overestimating the nutritional of quality of plant-based 'milk' products). This kind of confusion is ultimately best addressed empirically. However, given the results of our studies, the more subtle confusions about plant-based milk will also likely be present in animal-based milk products. So, we are skeptical that making the argument any more nuanced will help support the central empirical claim of those who favor restricting the use of 'milk' terms only for animal products. Finally, it is important to estimate the effectiveness of educational interventions versus policy level prohibitions on consumer product literacy about milk products.

Depending on one's perspective, these results do little to support the general claim that people are confused about animal-based and plant-based food products. Recall the main concern from the European Court's decision along with the Dairy Pride Act is that using 'milk' terms for plant-based products would cause confusion. We see little evidence that either kind of confusion exists—or that kind of confusion does not exist in any greater degree than it would exist if there were only animal-based milk products labeled using the term 'milk'.

Appendix A

Items used in Study 1. Correct answer in parentheses. Difficulty and discrimination, respectively, in brackets.

Soy Subscale

1. Whole cow milk has more cholesterol than fortified soy milk. (T) [-9.1, 0.17]
2. Whole cow milk has more protein than fortified soy milk. (F) [-0.23, -1.5]
3. Whole cow milk has more Vitamin C than fortified soy milk. (T) [0.31, 1.62]
4. Whole cow milk has more calories than fortified soy milk (T) [-3.4, 0.5]
5. Whole cow milk has more fat than fortified soy milk. (T) [-4.54, 0.47]
6. Whole cow milk has more fiber than fortified soy milk. (F) [0.44, -1.58]
7. Whole cow milk has more sodium than fortified soy milk. (T) [-0.37, 0.82]
8. Whole cow milk has more iron than fortified soy milk. (F) [-0.03, -2.4]
9. Whole cow milk has more saturated fat than fortified soy milk. (T) [-6.61, 0.3]
10. Whole cow milk has more calcium than fortified soy milk. (T) [-0.33, 1.66]
11. Whole cow milk has more carbohydrates than fortified soy milk. (T) [-0.92, 0.85]
12. Whole cow milk has more lactose than fortified soy milk. (T) [-4.86, 0.29]
13. Cow milk and fortified soy milk have all the same nutrients. (F) [1.63, -0.61]

Milk Subscale

14. Whole cow milk has more protein than skim cow milk. (F) [0.71, 1.48]
15. Whole cow milk has more fat than skim cow milk. (T) [12.85, -0.18]
16. Whole cow milk has more calories than skim cow milk. (T) [14.22, -0.18]
17. Whole cow milk has more calcium than skim cow milk. (F) [0.36, 2.62]
18. Whole cow milk has more Vitamin C than skim cow milk. (F) [-0.19, 2.36]
19. Whole cow milk has more sodium than skim cow milk. (F) [0.26, 1.59]
20. Whole cow milk has more fiber than skim cow milk. (F) [0.4, 2.11]
21. Whole cow milk has more cholesterol than skim cow milk. (F) [2.71, 0.81]
22. Whole cow milk has more iron than skim cow milk. (F) [0.39, 2.11]
23. Fortified soy milk is made with some cow milk. (F) -1.51, 0.62]

Appendix B

Items used in Studies 2. Items removed from Studies 3-8 in italics.

Soy Subscale

1. *Whole cow milk has more Vitamin C than fortified soy milk. (T)*
2. Whole cow milk has more calories than fortified soy milk (T)
3. Whole cow milk has more fat than fortified soy milk. (T)
4. *Whole cow milk has more sodium than fortified soy milk. (T)*
5. Whole cow milk has less saturated fat than fortified soy milk. (F)
6. Whole cow milk less more calcium than fortified soy milk. (F)
7. Whole cow milk has fewer carbohydrates than fortified soy milk. (F)
8. Whole cow milk has less lactose than fortified soy milk. (F)

Milk Subscale

9. Whole cow milk has more protein than skim cow milk. (F)
10. Whole cow milk has more calcium than skim cow milk. (F)
11. *Whole cow milk has more Vitamin C than skim cow milk. (F)*
12. Whole cow milk has more sodium than skim cow milk. (F)
13. *Whole cow milk has more fiber than skim cow milk. (F)*
14. Whole cow milk has more cholesterol than skim cow milk. (F)
15. Whole cow milk has more iron than skim cow milk. (F)
16. Fortified soy milk is made with some cow milk. (F)

Appendix C

Sample Product Identification Milk Items

Sample Product Identification Cheese Items

Milk Nutrition Identification Items

Cheese Nutrition Identification Items


NEW!
daiya
deliciously dairy-free
AMERICAN STYLE
SLICES
NET WT 7.8 OZ (220g)
DAIRY FREE
SOY FREE
GLUTEN FREE
KEEP REFRIGERATED


NO ARTIFICIAL PRESERVATIVES or FLAVORS
Kraft
Singles
AMERICAN
PASTEURIZED PREPARED CHEESE PRODUCT
24 SLICES

Table 1: Demographics for Studies 1, 3-8

Study #		**1**	**3**	**4**	**5**	**6**	**7**	**8**
Age	*M*	36.18	38.41	35.7	37.04	35.54	35.76	45.64
	SD	11.02	12.61	12.4	12.53	11.22	11.49	17.85
Male		51.3%	51%	48.8%	57.6%	58.4%	46.3%	34.7%
Religion								
	Catholic	17.5%	20.3%	21.6%	17.6%	30.4%	27.6%	--
	Protestant	30.7%	31.9%	25.6%	28%	27.2%	26.9%	--
	Mormon	0.9%	0.9%	0.8%	2.4%	1.6%	1.5%	--
	Muslim	2.6%	0.4%	2.4%	2.4%	1.6%	1.5%	--
	Jewish	1.3%	1.3%	5.6%	1.6%	1.6%	1.5%	--
	Atheist	19.3%	18.1%	17.6%	20.8%	12%	19.4%	--
	Agnostic	19.3%	21.1%	16.8%	18.4%	15.2%	17.2%	--

	Preferred not to indicate	8.3%	6%	9.6%	8.8%	10.4%	4.5%	--
Education								
	Grammar school	0%	0%	0%	0.8%	0.8%	0%	3.3%
	High School	10.5%	9.1%	13.6%	3.2%	10.4%	7.5%	25.8%
	Vocational	5.3%	3.9%	2.4%	3.2%	4%	3.7%	11.1%
	Some College	25%	31.5%	19.2%	27.2%	19.2%	32.1%	23.3%
	Bachelor's	38.6%	40.9%	50.4%	47.2%	45.6%	32.1%	23.6%
	Master's	17.5%	11.2%	8.8%	12%	14.4%	17.2%	--
	PhD	0.9%	0.9%	3.2%	3.2%	0.8%	3.7%	2.1%
	Professional	2.2%	2.6%	2.4%	0%	4.8%	3.7%	10.7%
Ethnicity								
	Arab	0%	0%	0%	0%	0%	0.7%	--

	Asian/Pacific Islander	5.7%	4.7%	10.4%	7.2%	7.2%	9.7%	9.1%
	Black	8.3%	6%	4.8%	9.6%	5.6%	*8.2%*	17.3%
	Caucasian/White	76.3%	78%	72.8%	73.6%	77.6%	74.6%	65%
	Hispanic	5.3%	6%	3.2%	6.4%	5.6%	3.7%	--
	Indigenous	0%	0%	0.8%	0%	0.8%	0.7%	1.5%
	Latino	0.9%	0.4%	3.2%	0%	0%	0.7%	--
	Multiracial	2.6%	3.9%	4.8%	0.8%	2.4%	0.7%	--
	Would rather not say	0.9%	0.9%	0%	2.4%	0.8%	0.7%	7.1%
Marital Status								
	Divorced	5.7%	9.5%	8%	5.6%	5.6%	7.5%	--
	Cohabitation	14.5%	10.8%	12.8%	9.6%	15.2%	4.5%	--

	Married	43.9%	39.2%	38.4%	49.6%	38.4%	44%	--
	Separated	1.8%	1.3%	0.8%	32.8%	0.8%	0.7%	--
	Single	34.2%	36.2%	37.6%	0.8%	36.8%	40.3%	--
	Widowed	0%	1.3%	1.6%	0.8%	3.2%	3%	--
	preferred not to respond	0%	1.7%	0.8%	1.6%	0%	0%	--
Income								
	<$10,000	3.1%	6.5%	8%	5.6%	4.8%	3%	--
	$10,000-19,999	7%	9.5%	9.6%	3.2%	6.4%	8.2%	--
	$20,000-29,999	16.2%	11.2%	9.6%	13.6%	14.4%	12.7%	--
	$30,000-39,999	14%	11.6%	11.2%	7.2%	14.4%	11.2%	--
	$40,000-49,999	12.7%	12.1%	11.2%	15.2%	7.2%	12.7%	--

	$50,000-74,999	24.1%	22.8%	22.4%	29.6%	24%	16.4%	--
	$60,000-99,999	12.7%	13.4%	14.4%	12%	19.2%	15.7%	--
	$100,000-150,000	5.7%	7.3%	5.6%	9.6%	3.2%	11.2%	--
	> $150,000	3.5%	1.7%	6.4%	3.2%	5.6%	7.5%	--
	Preferred not to respond	0.9%	3.9%	1.6%	0.8%	0.8%	1.5%	--
Living area								
	Urban	33.8%	30.6%	36%	0.8%	36%	37.3%	--
	Suburban	46.9%	52.2%	47.2%	33.6%	48%	47%	--
	Rural	19.3%	17.2%	16%	45.6%	16%	15.7%	--
	Preferred not to respond	0%	0%	0.8%	20%	0%	0%	--

Table 2: Descriptive IRT Statistics for the KAFS in Studies 2, 3, and 8

Item	**% correct**			**Difficulty**			**Discrimination**		
Study #	**2**	**3**	**8**	**2**	**3**	**8**	**2**	**3**	**8**
Knowledge 1	25			4.89			0.23		
Knowledge 2	77	73	73	-1.01	-.81	-1.12	1.7	1.95	1.06
Knowledge 3	80	80	79	-0.96	-1.02	-1.12	3.0	2.43	1.75
Knowledge 4	36			1.95			0.29		
Knowledge 5	65	71	52	-0.74	-0.93	-0.08	1	1.22	1.36
Knowledge 6	52	52	52	-0.09	-0.08	-0.13	1.19	1.06	0.82
Knowledge 7	40	48	41	0.57	0.07	0.42	0.85	1.91	1.01
Knowledge 8	70	77	65	-1.02	-1.22	-0.71	0.95	1.26	1.09
Knowledge 9	27	26	26	1	0.81	0.83	1.28	2.14	2.17
Knowledge 10	35	31	26	0.5	0.58	0.8	2.28	2.79	2.49
Knowledge 11	34			0.61			1.65		
Knowledge 12	26	27	25	1.2	1.42	1.31	1.06	0.81	1
Knowledge 13	37			0.53			1.48		
Knowledge 14	12	11	16	2.64	2.75	2.03	0.86	0.85	0.94

Knowledge 15	32	29	25	0.54	0.69	0.88	4.39	2.39	2.84
Knowledge 16	65	71	51	-1.08	-2.51	-0.1	0.62	0.37	0.44

*Table 3: Correlations among dependent variables in Study 3. * p < .05, ** p < .01*

	1	2	3	4	5	6	7	8	9	10
1. Soy	1									
2. Milk	.23**	1								
3. Nutrition	.52**	.3**	1							
4. Extraversion	-.09	.04	-.03	1						
5. Agreeableness	.13*	.05	.16*	.19**	1					
6. Conscientiousness	.22**	.07	.3**	.12	.3*	1				
7. Emotional Stability	.16*	.03	.19**	.29**	.35**	.49**	1			
8. Openness to Experience	.1	.07	.19**	.34**	.35**	.26**	.23**	1		
9. Age	.06	.17**	.21**	.14*	.25**	.27**	.24**	.06	1	
10. Sex	.06	-.04	-.01	-.07	-.18**	-.06	.08	-.16**	-.05	1
11. Politics	.12	.07	-.07	-.03	-.1	-.13	.07	-.24**	.01	.19**

*Table 4: Correlations from Study 4 and 5. * p < .05, ** p < .01*

	Study #	1	2	3	4	5	6
1. Plant-based ID	4	1					
	5	1					
2. Animal-based ID	4	.52**	1				
	5	-.04	1				
3. Soy MLS	4	.24**	.22*	1			
	5	-.12	-.14	1			
4. Milk MLS	4	.08	.05	.16	1		
	5	.01	-.09	.08	1		
5. Age	4	.08	.27**	.1	.11	1	
	5	.04	.05	.13	.12	1	
6. Sex	4	-.12	-.14	-.17	.01	-.13	1
	5	.02	.11	-.2*	-.21*	-.06	1
7. Politics	4	.37**	-.28**	-.18*	-.05	-.22*	.14
	5	.03	.21*	-.34**	-.1	-.05	.25**

Table 4: Correlations from Study 6 and 7

	Study #	1	2	3	4	5	6	7
1. Product Nutrition ID	6	1						
	7	1						
2. MLS Soy	6	.5**	1					
	7	.24**	1					
3. MLS Milk	6	.26**	.28**	1				
	7	.16	.21*	1				
4. Nutrition	6	.45**	.58**	.33**	1			
	7	.18*	.47**	.33**	1			
5. Numeracy	6	-.02	-.09	.02	.19*	1		
	7	0	0	.13	.13	1		
6. Age	6	0	.08	.07	.27**	.02	1	
	7	0	.1	-.01	.16	-.06	1	
7. Sex	6	-.36**	-.24**	-.02	-.19*	.13	-.1	1
	7	.07	-.13	-.04	-.21*	.07	-.09	1
8. Politics	6	-.2*	-.17	0	-.17	-.04	.06	.11
	7	-.1	-.09	.07	-.25**	-.07	-.02	.14

*Table 5: Stepwise Regression from Study 6. ** p < .01, * p < .05.*

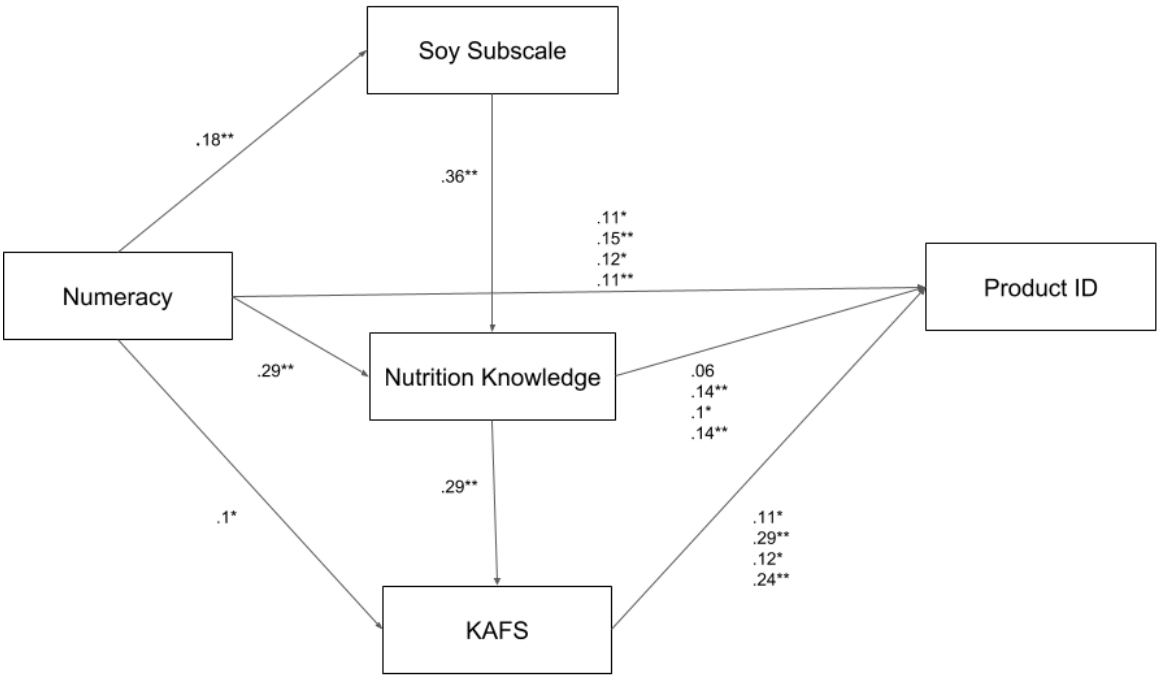
Model #	Predictor	β	Adjusted R^2	F	P	R^2_{Change}	F_{change}	P F_{change}
1	MLS Soy	.48**	.22	36.42	< .001	..22	36.42	< .001
2	MLS Soy	.31**	.27	24.17	< .001	.06	9.42	.003
	Nutrition	.29**						
3	MLS Soy	.28**	.29	18	< .001	.03	4.34	.04
	Nutrition	.27**						
	Sex	-.16*						

Table 6: Correlations from Study 8

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Animal Milk ID	1																	
2. Plant Milk ID	.11**	1																
3. Animal Cheese ID	.28**	.18**	1															
4. Plant Cheese ID	.16**	.42**	.08**	1														
5. Milk Nutrition	.08*	.14**	.07*	.14**	1													
6. Cheese Nutrition	-.05	-.01	-.05	..51**	.5**	1												
7. MLS Soy	.09**	.16**	0	.1**	.39**	.33**	1											
8. MLS Dairy	0	-.05	.16**	0	.13**	.13**	.24**	1										
9. Nutrition	.16**	.3**	.16**	.22**	.27**	.21**	.4**	.29**	1									
10. KAFS	.17**	.34**	.19**	.27**	.18**	.04	.17**	-.02	.35**	1								
11. Extraversion	0	-.02	-.06	-.08**	.03	.06	.07*	.05	.05	-.04	1							
12. Agreeableness	.08*	.15**	.03	.13**	.07	.01	.11**	-.04	.15**	.18**	-.08*	1						
13. Conscientious	.06*	.18**	.04	.12**	.1**	.04	.11**	-.05	.18**	.19**	.11**	.32**	1					
14. Emotional	.03	.05	0	.04	.06*	.04	.09**	.02	.11**	.05	.1**	.36**	.39**	1				
15. Openness	.06*	.13**	.05	.08**	.13**	.09**	.09**	-.01	.12**	.16**	.16**	.32**	.28**	.2**	1			
16. Age	.06*	.21**	.07*	.15**	-.03	-.08**	.12**	-.03	.25**	.18**	.04	.26**	.28**	.28**	.01	1		
17. Gender	-.1**	-.1**	-.06*	.06	-.04	.05	-.05	.02	-.13**	-.14**	-.02	-.09*	-.03	.05	-.07*	.02	1	
18. Politics	.05	.05	.01	.05	.04	-.01	.01	-.08*	-.03	-.06*	-.01	0	.07*	.01	-.1**	.12**	-.01	1

19. Numeracy	.17**	.23**	.19**	.19**	.07*	-.04	.13**	.05	.31**	.22**	-.05	.1**	.15**	.07*	.06*	.1**	.13**	.01

*Figures 1 and 2. Path Model of Product Identification in the Test Sample (first figure) and validation sample (second figure). The paths with one path coefficient were identical in all models because the same sample was used. The paths predicting the product identification were in the following order from first to last path coefficient: Animal-based Milk Product ID, Plant-based Milk Product ID, Animal-based Cheese Product ID, Plant-based Cheese Product ID. All significant paths were are marked * < . 05, ** < .01.*



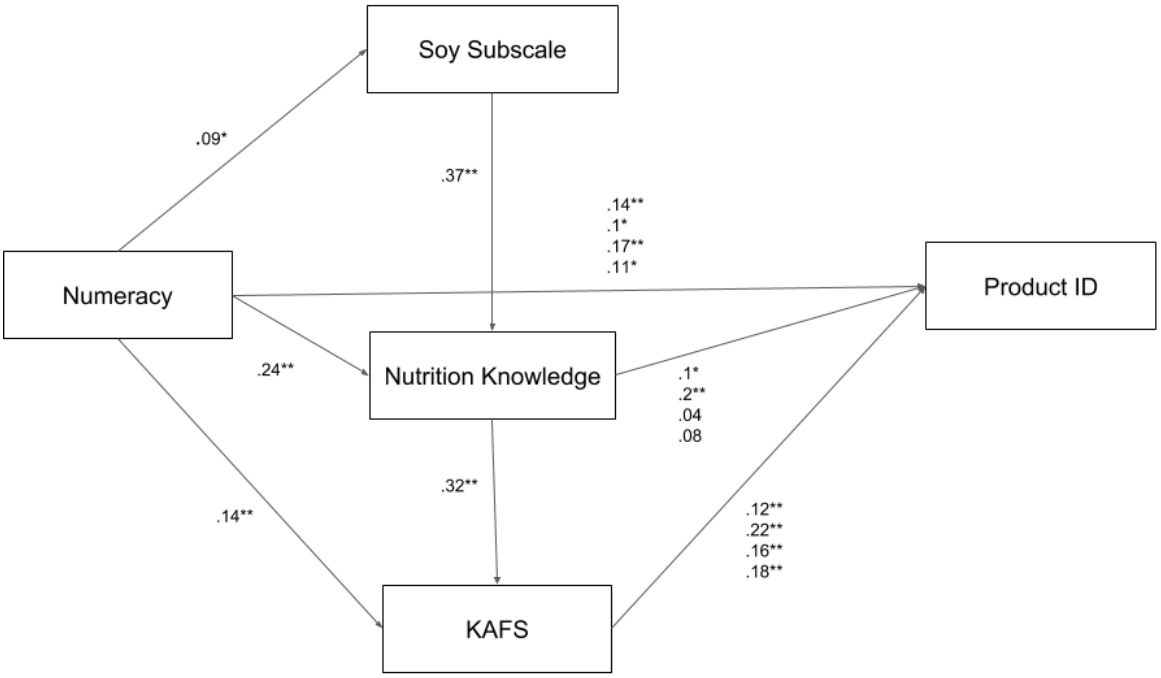
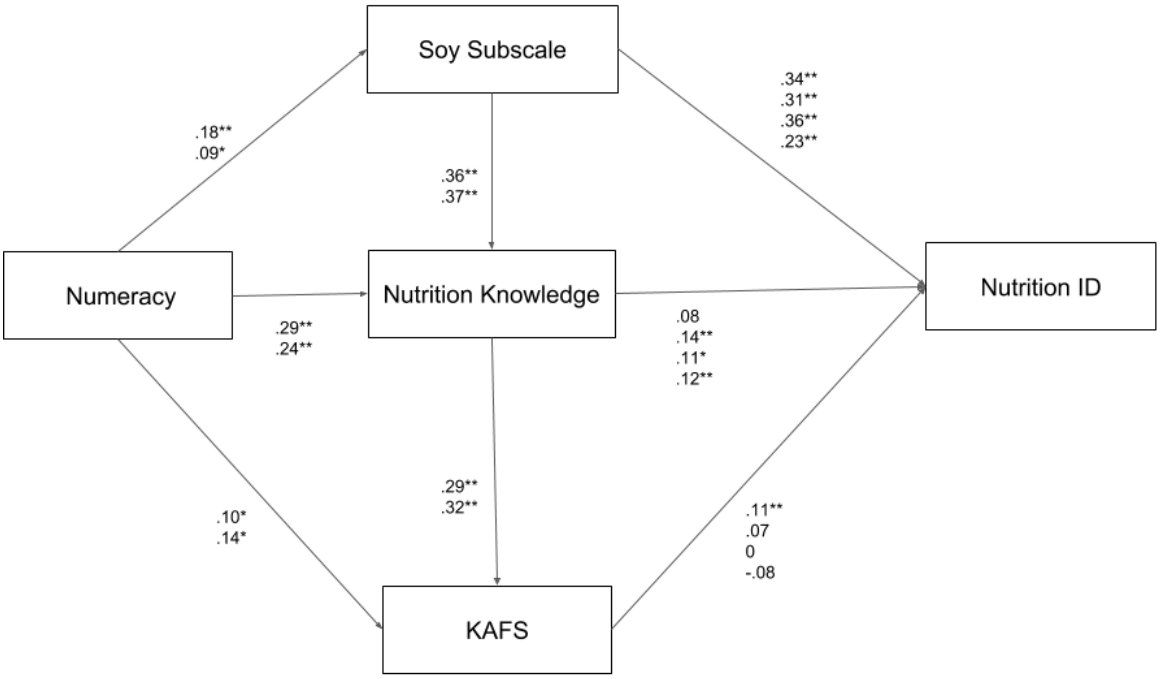

Soy Subscale
.09*
.37**
.14**
.1*
.17**
.11*
Numeracy
Product ID
.24**
Nutrition Knowledge
.1*
.2**
.04
.08
.32**
.14**
.12**
.22**
.16**
.18**
KAFS

*Figure 3. Path Model of the Nutrition Identification in the Test Sample and validation samples from Study 8. The paths with two path coefficient reflect the values from the test set and validation set (respectively). The paths with 4 path coefficients reflect the results in order: Milk nutrition identification test set, validation set, cheese nutrition identification test set, and validation set. All paths from the hypothesized models were included, significant paths were are marked * < . 05, ** < .01.*



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